JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

MARCH, 1832.

On the flow of Water through Tubes.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—The following solutions to some questions proposed to me by Mr. Frederick Graff, Esq. may perhaps prove interesting to some of the readers of the Journal of the Franklin Institute, and are therefore transmitted for publication.

Yours,
James P. Espy.

February 3d, 1832.

To Frederick Graff, Esq.

Dear Sir,—The answers to the following questions have been calculated at your request and are given below.

"What quantity of water will be discharged in twenty-four hours by a tunnel five feet clear in diameter, twenty-eight miles long, descending eighteen inches in each mile—starting with a head of twelve inches above the top of the inside of the culvert?"

Also, "What quantity of water will be discharged in twenty-four hours by an iron pipe thirty inches clear in diameter, of the same length, and the same head and fall?"

The first, I find, will discharge 20,649,600 gallons, and the second will discharge 3,650,400 in a day.

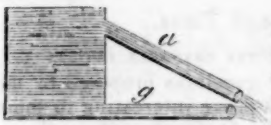
The calculation is made on the supposition that the tubes are perfectly straight and cylindrical, so as to cause no eddies, and permit no air to lodge in the upper parts of bends, which, if permitted, would materially diminish the discharge.

The formula used in the calculation is derived from experiments detailed in the Edinburgh Encyclopædia—art. Hydrodynamics—and may be expressed thus:

Let d be the diameter of the culvert or tube; h, the total head and fall of water, or the height of the water in the reservoir above the middle of the lower end of the pipe; l, the length of the pipe, or tunnel, all in inches; then the velocity in inches per second with which the water will flow in the pipe, will be v.

$v=23\frac{1}{8}\sqrt{\frac{57hd}{l+57d}}$, which in the first case, by calculating, I find to be twenty-three inches and nine-tenths per second; and in the second case $16\frac{9}{10}$ inches.

Now twenty-three inches and nine-tenths per second will give 57,360 yards per day, and as it is known that a cylinder of water one inch in diameter, and ten yards long, is one gallon, it will follow that each yard of the culvert, sixty inches in diameter, contains 360 gallons; but 360 multiplied by 57,360, the number of yards passing through the large tube in a day, gives 20,649,600, as before. In like manner, one yard of a thirty inch tube contains ninety gallons, and the velocity through this pipe of $16\frac{9}{10}$ inches per second, gives 40,560 yards per day, and this multiplied by ninety gives 3,650,400 gallons per day.



You will perceive the calculation is made on the presumption that it is indifferent whether the water be taken out of the bottom of the reservoir, as g, or near the top with a sloping tube, as at a. I see no reason to believe there is any difference, provided there is head enough in the latter case to flow in as fast as it can run through the tube.

By a similar calculation, I find if the sixty inch tunnel, with a similar slope, is only thirteen miles long, the velocity of discharge will be 24.78 inches per second, and will therefore discharge in twenty-four hours 21,330,000 gallons. In like manner it will be found that a tube of twenty inches in diameter, four miles long, with a head and fall of one hundred feet, will discharge about one-sixth more water than three tubes of twelve inches in diameter of the same length with a similar head and fall.

Yours, respectfully,
J. P. Espy.

Notes of an Observer.—*On the futility of the attempt to communicate mechanical power to a distance through air tubes.*

Dr. Robison, in his third volume of Mechanical Philosophy, gives an account of an attempt made by Dr. Papin to use condensed air as a mechanical power. The failure was complete: I propose to investigate the cause.

He proposed to raise water out of a mine by a water power at the distance of a mile from the mine. He employed the water to drive a piston which should compress the air in a cylinder, communicating by a long pipe with another cylinder at the mouth of the mine. He expected that as soon as the piston at the water power had compressed the air to a certain extent in the tube, it would rush into the cylinder at the mine, force up its piston, and thus work the pump, discharging the water from the mine.

The machine, however, would not work, and as he attributed the failure to the immense quantity of air in the tube, he diminished the diameter of the tube, and arranged his water power so as to exhaust the air, believing that the immense velocity with which air rushes into a vacuum, would make a rapid and effectual communication of power. But he was as entirely disappointed in this arrangement, as he was in the other. Experiments of this kind were made both in Westphalia and Auvergne.

Notwithstanding this failure was complete, an engineer, many years afterwards, "erected a machine, in Wales, at a powerful fall of water, which worked a set of cylinder bellows, the blow-pipe of which was conducted to the distance of a mile and a half, when it was applied to a blast furnace. But although care was taken to make the conducting pipe completely air tight, of great size, and as smooth as possible, it would hardly blow out a candle. The failure was ascribed to the impossibility of making the pipe air tight. But what was surprising, above ten minutes elapsed after the action of the pistons in the bellows before the least wind could be perceived at the end of the pipe; whereas, the engineer expected an interval of six seconds only."

If we take a particular case, and calculate the resistance of air moving through pipes according to acknowledged principles, we shall find that there is nothing mysterious in the above results. It will be found that if the blow-pipe is three inches in diameter, and only a mile long, the air at one end must be kept constantly condensed by a pressure equal to $5\frac{4}{10}$ atmospheres, to produce a velocity of 128 feet per second. And yet this velocity gives only 2,304 gallons per minute, only about half the quantity used in the furnaces of Europe; for, according to Dr. Robison, a blast furnace there expels 720 cubic feet of air per minute.*

If we calculate the velocity of water issuing from a pipe one mile long and three inches in diameter, under a nine feet head and fall, according to the formula given in the preceding article, it will be found to be one foot per second.

Now as equal velocities are generated in all fluids by equal heads, all other circumstances being equal, it will follow that a nine foot head of air, or one eight-hundredth of a head of nine feet of water, will generate in air a velocity of one foot per second in a tube three inches in diameter, and one mile long.

Again, it is known, both from theory and experiment, that the heads of pressure generating velocity in fluids, are as the squares of

* Mechanical Philosophy, vol. viii. p. 784.

the velocities. Now the square of one is one, and the square of 128 is 16384, therefore the head of pressure due to the velocity of 128 feet per second, is obtained by the following proportion, as 1 : 16384 : : 9 to 147456, and this number divided by 800 gives $184\frac{1}{3}$, equal to a pressure of $5\frac{4}{10}$ atmospheres, as was said above.

Now if we suppose this velocity doubled, or 256 feet a second, in order to discharge air enough to supply a blast furnace, the head of pressure will be four times as great, or upwards of twenty-one atmospheres.

This would require a machine equal to a thirty-four hundred and twenty-six horse power, provided a horse can work eight hours a day, and raise one hundred and forty pounds, two hundred feet per minute. Perhaps it may be thought that the great pressure on the inside of the tube will still further increase the resistance; such, however, is not the fact, for it is known that the same quantity of water will be discharged through a curved tube under a given head, whether the curve is vertical or horizontal, thus proving that the increased pressure when the curve is vertical does not increase the resistance. Indeed the diminished velocity which results from increased density in the tube, would indicate, from theory, a diminished resistance.

The precise effect of increased density and diminished velocity, I shall discuss at some future occasion. Enough has been said to show that it is utterly vain to attempt to transmit mechanical power to any great distance through pipes by means of air.

FRANKLIN INSTITUTE.

Reports of the Judges of the Seventh Exhibition of the Franklin Institute.

Report of the Judges on Musical Instruments.

The judges on musical instruments respectfully report, that they have carefully examined the several instruments committed to their notice, and beg leave to present their *unanimous* opinions, as follows:

No. 433. A square piano of three strings, made by Loud & Brothers, merits attention, being in many respects a superior instrument, possessing durability, and brilliancy of tone.

No. 435, is a square piano, made by Loud & Brothers, of superior, but delicate tone, and well calculated for the voice.

No. 471, is a semi-upright piano, made by J. J. Mickley, of excellent workmanship, and of a silvery, soft, and brilliant tone, but too weak.

No. 435, is a square piano, made by —— Geib, of New York, of a bold and powerful tone, and considered a good instrument.

No. 324. A square piano, made by Conrad Myer, possesses some merit, with the middle tones of good quality.

No. 343. A square piano, made by E. N. Scherr, is a good instrument, possessing brilliancy of tone, of good action, and remarkable for the superior finish of the internal mechanism. The fine open tone

of this instrument, is, (perhaps,) injured by the useless, but splendid, heavy exterior cabinet work.

No. 345, is a harp guitar, a new invention, made and patented by E. N. Scherr, to whose ingenuity the public is indebted for the production of so good and sweet an instrument, *which well deserves a premium.*

No. 344, is an harmonica, made by E. N. Scherr, that especially deserves commendation; this instrument is well adapted for the parlour or hall, of sweet, yet powerful tone, of most splendid workmanship in each and every particular, and in the opinion of the committee richly *merits a premium.*

No. 384. A flute patented by Mr. Cuddy, made by Firth & Hall, has many excellent qualities; the trumpet mouth is an improvement, possesses a perfect tone, and, in our estimation, is superior to No. 385.

No. 385. A flute made by E. Riley, New York, is of excellent workmanship, and possesses many good qualities.

No. 391. A metronome made and invented by Mr. Maelzell, is a good invention, and has proved, in many instances, to be of much value.

No. 198. The metrotone invented by Mr. Francis H. Smith, is an instrument of ingenious contrivance, capable of describing to a well cultivated ear, *seventy-two distinct sounds in one whole tone.* We consider this invention a useful one, as it will enable Mr. Smith to present to the public his grand harmonica in perfect tune.

No. 197. The grand harmonicon, or musical glasses, patented by Mr. Francis H. Smith, is a pleasing instrument, differing essentially from, and superior to, the musical glasses heretofore brought before the public. The quality of tone is rich, and with its sweetness combines great power. This instrument, we are of opinion, *deserves a medal.*

To the above, we, the judges, do respectfully affix our signatures.

William Norris, Jr.
Abraham Ritter.
J. C. B. Standbridge.

Report of the Judges on Chemicals.

The judges on chemicals report, that they have examined the articles in that department offered for exhibition, and submit the following remarks.

Chemicals from John Elliot, and Wetherill & Brothers—all these articles are of good qualities, and in most cases choice specimens have been selected. The sugar of lead from Wetherill & Brothers, is particularly to be noticed for its beauty.

Pyroligneous acid—M. & S. N. Lewis. This specimen is a concentrated acetic acid of considerable strength and purity. The manufacturers deserve much credit for the perseverance which they have

shown in introducing this valuable article, and the perfection in which they now make it.

Purified vegetable oils from J. M. Truman. These oils are very beautiful, that from cotton seeds, in particular, is a new and successful attempt. The committee subjoin a letter from the manufacturers, explaining the qualities, &c. of the oil. They have pressed twelve bushels of the seed, and think it yields from three quarts to a gallon per bushel. They have also a large quantity of the crude oil from the south, which they are now purifying. We understand that at the mill in Richmond two bushels of the seed yield three gallons of oil. The manufacturers here estimate the cost of expressing and purifying the oil to be fifty cents per gallon; so that it will, in all probability, become a very important article of trade.

The spermaceti of Charles Morgan of New Bedford, deserves notice for its extreme whiteness and dryness.

The oils of cantharadin and mustard seed, are said to be solutions in oil of the active principles of those substances separated by ether. The committee have no data from which to judge of their peculiar excellence.

The tonic mixture is a secret medicine, which the committee apprehend does not come within the views of the Institute in getting up this exhibition. If nostrums and secret remedies be admitted, the Institute will find that all who prepare them will seek to place them in the room merely to advertise them more publicly.

Respecting the remaining articles, the judges have nothing to observe.

DANIEL B. SMITH,
HENRY SEYBERT,
HENRY TROTH,
ALGERNON S. ROBERTS.

Philadelphia, 10 *mo.* 8*th*, 1831.

Letter from Joseph M. & George Truman to the Judges on Chemicals.

Philadelphia, 10 *mo.* 7*th*, 1831.

In regard to the queries respecting cotton seed oil, as to quantity obtained, use, &c., we can inform you that from about three quarts to one gallon of oil can be obtained from a bushel of seed by two expressions, for both of which the seed should be moderately heated, either by means of steam or hot air; the heat from steam, however, is preferable, thereby preventing the danger of burning, which imparts a disagreeable odour, difficult to eradicate. The oil obtained is thick, and of a very dark brown colour, as may be perceived by the sample presented. When submitted to our process of refining, the loss in oil is from ten to twelve per cent., leaving a dark mucilaginous deposit, which, we believe, may be applied to useful purposes, particularly in the manufacture of soap. As the oil from cotton seed is nutritious we see no reason why it may not, on further purification, be used for the table; it has a drying property, but not sufficient for

the painter without additional means to make it more so; it does not burn as well as sperm oil; in burning it yields a clear flame, but requires more frequent attention to clean the wick than sperm oil does. We believe it may be used in the woollen manufacture to advantage. It is about equal to olive oil in withstanding the cold of our climate; the refined oil could be sold at one dollar per gallon—there is no deleterious substance used in the process of refining, and when completed no portion whatever of the substances used remains in it.

The sunflower seed oil is obtained, as that from cotton seed, by two expressions; the first cold, for the second the seeds are to be warmed by hot air. About one gallon of oil can be obtained from a bushel of good seed. The oil from the first pressing is much more pure than that from the second, and comes from the press with less colour, but the product of the second pressing becomes equally pure when refined. It is equal for burning to sperm oil, and will not freeze in our climate, and therefore is superior for that purpose to any oil in use; this oil, we believe, will answer for table use, as well as for the woollen manufacture, and for oiling machinery it is superior to olive oil, not corroding brass, &c. The oil would be worth from one dollar to 1 25 per gallon, paying for seed 62½ cents the bushel; it possesses a drying property, and has been used to advantage by a calico printer in preparing certain colours used by them.

In regard to queries respecting the refining of whale oil, we will simply remark, that our process of refining this oil is advantageous in a commercial point of view, being able to do it rapidly and certainly; we refined about 24,000 gallons of this oil during three months of the past summer; the oil is rendered much more pure and pale, and burns with a clear white flame, but requires attention. The process of refining does not alter its character as regards the resistance to the cold of our climate; it is altogether a summer oil. We have on hand about 1,500 gallons of this oil which we will sell at fifty cents per gallon.

Respectfully,

JOSEPH M. & GEORGE TRUMAN.

Report of the Judges on Cabinet Ware.

The judges on cabinet furniture, &c. having carefully examined the different articles submitted to their inspection, respectfully report:—

That the large sideboard deposited by Mr. Charles H. White, is an excellent piece of work, both as to design and usefulness, and although as being a member of the Board of Managers the regulations *forbid* any premium or compliment to himself, we would respectfully recommend the workman who displayed his abilities in making it, as worthy of some token of encouragement.

The wardrobe, loo table, pier tables, arm chairs, and sofa, are all fair specimens of Mr. White's style of work. The lady's dressing table, by Joseph Barry, is a good piece of work, and will bear inspection.

The toilet and lady's work table, by A. G. Quervelle, are handsome articles in his usual good style of workmanship.

The globe work table sent by Michael Bouvier, is a very neat article, and does credit to the workman who made it. Although we cannot commend the design or workmanship of the secretary and bookcase, sent by Mr. Robinson, yet from its being veneered with a fine specimen of our native ash, and having been made by an apprentice, who has not yet been two years at the trade, we recommend him as deserving some encouragement.

We have also examined the hair cloth, and pronounce it a good specimen of American manufacture.

The patent swelled windlass bedstead is also a real improvement, and deserves encouragement. The spring mattrass has been already proved to answer the purpose intended. The scrap table deserves particular notice for the exact arrangement of the figures; and the two japanned tables are also remarkably fine specimens of ornamental work. The three pieces of American oak, cut from the same log, by Mr. Ramage, show the appearance of the surface by being cut in different directions. We think the round table painted to imitate different woods the best specimen we have seen; it deceived some of the best judges.

JOS. B. BARRY.
JOHN JAMISON,
ADAM RAMAGE.

Philadelphia, October 7, 1831.

Chain Cables.

A question of some considerable moment has been presented to us, respecting the relative goodness of chain cables manufactured in this country, and those made in Wales. It appears that the American made cables are not to be trusted; not because the iron itself is not equally good with the foreign, but because there are some bad links in nearly every chain, that give way when submitted to the test which the imported cables will uniformly bear. It has been said that this is owing to the difference in the mode of making the links; that in Wales they are not touched with the hammer excepting whilst they are at a good red heat, and that they are consequently left in an annealed and tough state. We see some valid objections to this explanation, but whatever be the cause, whether the defect is in the iron master, or in the smith, it ought to be discovered, and the remedy applied. There is too much at stake, when a vessel is dependent for safety upon her cable, to admit of any one employing those in which the fullest confidence cannot be placed. We wish that such as are able would give us their views and experience upon this subject. If the difference under consideration is in the manipulation, and not in the iron, the facts in reference thereto may lead to valuable results in other branches of the iron business, such, for example, as the manufacture of boiler iron, and indeed of all articles where great tenacity is of essential importance.

EDITOR.

Continuation of the Report of the Committee of the Franklin Institute of Pennsylvania, appointed May, 1829, to ascertain, by experiment, the value of Water as a Moving Power.

(Continued from p. 39.)

TABLE R.

CHUTE No. 7.—*Undershot. Centre Buckets. Wheel running close to Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of water above. Bttm. of gate.	Head of water above. Top of bkt.	Head of water above. Bttm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	14.75		14.75	0.75	360	45.69	405.69	41.5	31	12.60	4225	14.75	623187	168361	.267			Air vents open. Water thrown violently through them up to centre of wheel.
2					416	46.59	462.59		36	10.86	4750		700625	191974	.273	.273	10.86	
3					463	47.32	510.32		41	9.54	5500		811250	211782	.261			
4	12.00		12.00	1.00	257	44.06	301.06	41.5	28	13.96	4260	12.00	511200	124940	.244			The frictions for the small weights of experiments, 12, &c. were calculated upon the principles given in pages 78 & 79, vol. viii.
5					360	45.69	405.69		33	11.84	5100		612000	168361	.275			
6					463	47.32	510.32		39	10.02	6225		747000	211782	.284	.284	10.02	
7					519	48.21	567.21		45	8.70	7350		882000	235392	.266			
8					566	48.95	614.95		53	7.38	8350		1020000	255204	.250			
9	8.00		8.00	1.50	257	44.06	301.06	41.5	29	13.48	6700	8.00	536000	124940	.235			
10					360	45.69	405.69		35	11.16	7900		632000	168361	.266	.266	11.16	
11					463	47.32	510.32		52	7.52	10125		810000	211782	.261			
12	2.00		2.00	2.00	20	40.30	60.30	41.5	54	7.24	7060	2.00	141200	25024	.177			
13					48	40.74	88.74		59	6.62	7800		156000	36826	.240			
14					62	40.96	102.96		64	6.10	8200		164000	42727	.260			
15					76	41.18	117.18		66	5.92	8675		173000	51628	.298	.298	5.92	
16					146	42.28	188.28		127	3.08	16525		330000	81123	.245			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

Table S.—Part I.

Chute No. 7.—*Undershot. Centre Buckets. Wheel running close to breast. Bottom of gate at bottom of wheel.*

No. of Exper't.	Head of water above. Bttm. of gate	Top of bkt.	Bttm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt. of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	23.00		23.00	1.00	566	45.95	611.95	41.5	20	19.54	4200	23.00	966000	253960	.262			Half the soling taken out, from behind each float board.
2					669	47.58	716.58		23	17.00	4525		1040750	297380	.285			
3					772	49.21	821.21		25	15.64	5050		1161500	340801	.293			
4					875	50.84	925.84		27	14.46	5675		1315250	384223	.294	.294	14.46	
5					978	52.47	1030.47		32	12.20	6550		1506500	427644	.284			Wheel worked smoothly; no water dashed over the soling.
6	20.75		20.75	0.75	360	42.69	402.69	41.5	23	17.00	3300	20.75	684750	167116	.243			
7					463	44.32	507.32		29	13.46	3850		798975	210537	.275	.275	13.46	
8					566	45.95	611.95		36	10.86	4750		985625	253960	.257			Three pounds deducted from friction due to weight of wheel; on account of half the soling removed.
9					669	47.58	716.58		43	9.09	5800		1203500	297380	.247			
10	20.75		20.75	1.00	566	45.95	611.95	41.5	22	17.76	4450	20.75	923375	253960	.274			
11					669	47.58	716.58		24	16.28	4850		1006375	297380	.295	.295	16.28	
12					772	49.21	821.21		31	12.60	5675		1177560	340801	.280			
13	17.75		17.75	0.75	257	41.06	298.06	41.5	26	15.00	3050	17.75	541375	123695	.228			
14					360	42.69	402.69		29	13.48	3675		652312	167116	.287	.287	13.48	
15					416	43.59	459.59		31	12.60	4050		718875	190730	.265			
16					463	44.32	507.32		36	10.86	4675		829812	210537	.253			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

Table S.—Part II.

Chute No. 7.—*Undershot. Centre Buckets. Wheel running close to Breast. Bottom of Gate at bottom of Wheel.*

TABLE S.—PART II.

CHUTE No. 7.—*Undershot. Centre Buckets. Wheel running close to Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of Water above. Bttm. of gate. Feet.	Top of Bkt. Feet.	Bttm. of Bkt. Feet.	Width of Aperture. In.	Weight raised. Pds.	Friction. Pounds	Sum of friction and weight raised. Pounds.	Height raised. Feet.	Time. Scds.	Velocity per second. Feet.	Wt of water expended. Pds.	Head and fall. Feet.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
17	17.75		17.75	1.00	430	43.81	473.81	41.5	23	17.00	4225	17.75	749930	196631	.262			
18					463	44.32	507.32		24	16.28	4300		763250	210537	.276			
19					566	45.95	611.95		27	14.46	4900		870750	253960	.292	.292	14.46	
20					669	47.58	716.58		33	11.84	5775		1024812	297230	.290			
21					772	49.21	821.21		40	9.77	7000		1242500	340801	.282			
22	4.67		4.67	1.75	146	39.28	185.28	41.5	42	9.30	7000	4.67	326900	76891	.235			
23					202	40.16	242.16		48	8.14	8200		382940	100496	.262			
24	4.67		4.67	2.00	146	39.28	185.28	41.5	39	10.02	7430	4.67	346981	76891	.221			
25					202	40.16	242.16		45	8.70	8450		394615	100496	.253			
26					230	40.60	270.60		47	8.32	9000		420300	112299	.266			
27					257	41.06	298.06		51	7.66	9850		459995	123705	.268	.268	7.66	
28	4.67		4.67	2.25	257	41.06	298.06	41.5	48	8.14	9900	4.67	462330	123705	.266			
29					285	41.50	326.50		50	7.82	10425		486847	135497	.277			
30					299	41.72	340.72		52	7.51	10775		503192	141398	.279			
31					313	41.94	354.94		54	7.23	11075		517102	147300	.283	.283	7.23	
32					341	42.38	383.38		57	6.85	12650		590755	159102	.267			
33	2.00		2.00	2.50	76	38.18	114.18	41.5	64	6.10	9700	2.00	194000	47373	.247			
34					90	38.38	128.38		69	5.66	10600		212000	53277	.253			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

Table T.—Part I.

Chute No. 7.—*Undershot. Wheel removed from Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of water above. Btm. of gate. Feet.	Top of bkt. Feet.	Btm. of bkt. Feet.	Width of Aperture. In.	Weight raised. Pds.	Friction. Pds.	Sum of friction and weight raised. Pounds.	Height raised. Feet.	Time. Secs.	Velocity per second. Feet.	W't of water expended. Pds.	Head and fall. Feet.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
1	20.75		20.75	1.00	669	47.58	716.58	41.5	26	15.00	4925	20.75	1021937	297379	.290			
2					725	48.45	773.45		27	14.46	5325		1104937	320981	.290			
3					772	49.21	821.21		28	13.96	5560		1153700	340801	.296	.296	13.96	
4					800	49.65	849.65		29	13.46	5760		1195200	352604	.293			
5					828	50.09	878.09		31	12.60	6000		1245000	364407	.292			
6					875	50.84	925.84		34	11.50	6550		1359125	384223	.282			
7	20.75		20.75	1.25	875	50.84	925.84	41.5	25	15.64	6155	20.75	1277062	384223	.300	.300	15.64	
8					978	52.47	1030.47		29	13.46	7025		1457687	427644	.291			
9					1081	54.10	1135.10		33	11.84	7925		1644437	471065	.287			
10	4.67		4.67	1.75	202	40.16	242.16	41.5	48	8.14	8075	4.67	377100	100496	.266			
11					230	40.60	270.60		51	7.66	8800		410960	112299	.276	.276	7.66	
12					244	40.82	284.82		58	6.73	9775		456492	117200	.258			
13	4.67		4.67	2.50	285	41.50	326.50	41.5	47	8.32	10800	4.67	504360	135497	.266			
14					313	41.94	354.94		50	7.82	11500		537050	147300	.274			
15					341	42.38	383.38		51	7.66	11775		549892	159102	.290			
16					360	42.69	402.69		54	7.23	12200		569240	167116	.293			
17					374	42.91	416.91		56	6.98	12800		597760	183017	.305	.305	6.98	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

Table T.—Part II.

Chute No. 7.—*Undershot. Wheel removed from Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of water above. Bttm. of gate.	Top of bkt.	Bttm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
18	3.00		3.00	2.00	76	38.18	114.18	41.5	48	8.14	7300	3.00	219000	47373	.216			
19					146	39.28	185.28		62	6.30	9300		279000	76891	.275			
20					160	39.50	199.50		65	6.01	9920		297600	82792	.277	.277	6.01	
21					188	39.90	227.90		81	4.82	12000		360000	94578	.262			
22	3.00		3.00	2.50	146	39.28	185.28	41.5	55	7.10	10375	3.00	311250	76891	.247			
23					160	39.50	199.50		56	6.98	10600		318000	82792	.264			
24					188	39.90	227.90		60	6.51	11575		347250	94578	.272	.272	6.51	
25					202	40.16	242.16		65	6.01	12425		372750	100596	.269			
26	2.00		2.00	2.00	76	38.18	114.18	41.5	69	5.66	8400	2.00	168000	47373	.281			
27					79	38.23	117.23		72	5.43	8710		174200	48650	.279			
28	1.00		1.00	1.50	20	37.30	57.30	41.5	131	2.98	10625	1.00	106250	23779	.232			
29			1.00	1.75	20	37.30	57.30	41.5	105	3.72	10110	1.00	101110	23779	.241			
30			1.00	2.00	20	37.30	57.30	41.5	91	4.29	10400	1.00	104000	23779	.238			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

FRANKLIN INSTITUTE.

Minutes of the Board of Managers.

A MEETING of the Board of Managers of the Franklin Institute, was held at the Hall of the Institute, January 26, 1832.

JAMES RONALDSON, President, in the chair.

So much of the minutes of the Institute as related to the election of this Board, was read by the Actuary, when, on motion, the Board went into an election for a chairman for the ensuing year. Messrs. Thomas Fletcher and Isaac B. Garrigues, were appointed tellers, who received the votes of the members, and reported the result to the president, who declared WM. H. KEATING, Esq. duly elected chairman.

Mr. Keating made an appropriate address, and took his seat as presiding officer, when the Board continued the election for Curators for the ensuing year; the same tellers were continued, the following gentlemen were duly elected curators—SAMUEL J. ROBBINS, ISAAC HAYS, M. D.

The regulations adopted by the former Board were read, and after some amendments were adopted for the government of this Board.

On motion, the committees appointed by the late Board to try experiments on water wheels, and to inquire into the cause of the explosions of the boilers of steam engines, were continued.

A stated meeting of the Board of Managers was held at the Hall of the Institute, February 9, 1832.

WM. H. KEATING, presiding.

The minutes of the last meeting were read and approved.

The chairman nominated the several standing committees agreeably to the regulations, when, on motion, the names of Messrs. Christian Gobrecht and W. R. Johnson, were added to the committee on inventions—Mr. Wm. H. Keating to the committee on premiums and exhibitions; and Mr. Jacob Pierce to the committee on minerals. The committees were then constituted as follows, viz.

On Premiums and Exhibitions.

S. J. Robbins,
Frederick Fraley,
M. W. Baldwin,
Joshua G. Harker,
Alexander Ferguson,
J. Henry Bulkley,
Isaiah Lukens,
Wm. Wetherill,
Wm. H. Keating.

On Inventions.

Samuel V. Merrick,
Benjamin Reeves,
Alexander Dallas Bache,
James Ronaldson,
Isaiah Lukens,
M. W. Baldwin,
Rufus Tyler,
John Agnew,
Christian Gobrecht,
W. R. Johnson.

On the Library.

M. D. Lewis, Wm. B. Reed,
Isaac Hays, John B. Trevor.
Alexander Ferguson,

On Publications.

Isaac Hays, M. W. Baldwin,
Samuel V. Merrick, Charles Toppan.
Alexander Dallas Bache,

On Instruction.

Alexander Dallas Bache, Samuel J. Robbins,
Charles H. White, John Weigand.
Frederick Fraley,

On the Cabinet of Minerals.

Isaiah Lukens, Thomas Scattergood,
William Wetherill, George W. Tryon,
Abraham Miller, Jacob Pierce.

On the Cabinet of Models.

Frederick Fraley, Isaac B. Garrigues,
Rufus Tyler, Charles H. White.
John Agnew,

Managers of the Sinking Fund.

Samuel V. Merrick, John Struthers.
John B. Trevor,

Auditors.

Mordecai D. Lewis, Isaac B. Garrigues.

The candidates proposed at the last meeting were duly elected members of the Institute.

Several candidates for membership were proposed, and laid over until the next meeting, agreeably to the by-laws.

Extract from minutes.

WILLIAM H. KEATING, *Chairman.*
WILLIAM HAMILTON, *Actuary.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN SEPTEMBER, 1831.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the *Marine Rail-way*, for the purpose of hauling vessels out of the water; John G. Colley, Shipwright, Norfolk, Virginia, September 1.

This rail-way is the well known Moreton's rail-way, which forms an inclined plane, upon which vessels are to be hauled up. The improvement consists in having a tongue project up from the centre of the iron plate with which the rails are faced, and in having grooves

in the middle of the rollers into which the tongues enter, and serve as guides. The cradle upon which the vessel is received has similar plates and tongues on its lower side, which work into the grooves on the upper sides of the said rollers.

The foregoing is the whole substance of the specification; no claim is made, but it is plain that the tongued plates, and grooved rollers, are considered as constituting the invention.

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2. For an improvement in the *Machine for Shelling and Cleaning Corn;* Jesse Reed, Marshfield, Plymouth county, Massachusetts, September 1.

A cylinder of wood, about ten inches in length, and six in diameter, is to be set with spikes. This cylinder has a pinion on one of its axles into which meshes a cog wheel, turned by a crank. The ears of corn are borne up laterally against the cylinder by which they are shelled; wires are so placed in the check which bears against the corn as to give it a progressive motion. The bottom is formed of wire grating, which allows the chaff, but not the corn, to pass through; this latter, with the cob, falls down a trough at the end of the machine.

The claims are to the horizontal cylinder; the pitch of the bed piece on which the ear rests; the grates for conducting and cleaning the corn; the wires on the arm which regulate the ear; and the enclosing the machine so as to prevent the scattering of the corn.

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3. For an improvement in the *Scraper for the removal of earth;* denominated the "excavating scraper," Dudley Marvin, Canandaigua, Ontario county, New York, September 2.

(See specification.)

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4. For an *Apparatus for excavating and removing Earth,* denominated the "inclined plane excavator;" Dudley Marvin, Canandaigua, Ontario county, New York, September 2.

(See specification.)

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5. For an instrument for determining the points in *Marking and Cutting Garments,* called the "American System;" John Pudney, Waterford, Saratoga county, New York, September 3.

Mr. Pudney's American System consists of a square like that of a carpenter, formed of wood or metal, one of the arms being about two feet in length, and the other about six inches. A segment of a circle unites the long and short arms, the angle of the square being its centre; a tongue, or secondary arm, works upon a joint at this centre, and opens like a rule. There are divisions, with letters and figures on the circular segment, and others on the arms, which serve as a scale to mark the points for cutting garments.

The claim is to the before described instrument.

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6. For an improved *Scraper and Harrow*, to be used in the

cultivation of Cotton; William P. Sample, Bedford county, Tennessee, September 3.

The frame work of this instrument resembles that of the well known triangular harrow, or cultivator. The patentee states that other scrapers have been made which nearly resemble his, but that their frame work was so constructed as to cause the horse employed to draw them, to trample upon the cotton, whilst by his construction, the animal is removed a foot from the rows. Scrapers, in the form of a V, are fixed upon helves so as to work upon each side of the row of cotton; these scrapers are so formed as to cut the surface, and cover low grass and weeds with earth. It is said that in consequence two scrapers being fixed on the same instrument, it executes double the work of any other. The patentee, however, relies principally on the form of the wooden part, as sustaining his claim to novelty.

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7. For a *Machine for digging Ditches and excavating Canals;* William Graham, New Orleans, Louisiana, September 5.

A wheel, made somewhat like the bucket wheel of a water mill, is to perform the excavating, for which purpose the buckets, or arms, are to have their edges armed with steel cutters.

This excavating machine is to be driven by horse or steam power, through the medium of a crank, and a train of wheel work. A frame is to be made of sufficient strength to support the whole apparatus, which is to be fixed upon wheels, and moved forward by the same power that drives the excavating wheel, which wheel is fixed upon a shaft supported by the carriage frame. A steam engine may be employed to drive a pinion on a crank shaft, which, taking into a spur wheel on the shaft of the excavator, will give it the required motion. To cause the carriage to advance as the excavation proceeds, two of the carriage wheels are to be turned by means of endless screws, driven by bevel gear from the shaft of the excavating wheel.

The earth removed by the cutters, is to be carried up by the arms or buckets, until it arrives at its greatest elevation, but when it has passed a line perpendicular to the centre of the wheel's motion, it is to be forcibly thrown off on to a sloping roof fixed for that purpose. In beginning to work with it, an excavation must be made in the ground to receive the operating wheel.

The patentee says that with an engine of eight horse power, this machine will perform the labour of three hundred hands.

If the inventor has actually tried his machine and fully tested its utility, his experience is worth infinitely more than all our speculations. Should it have answered its intention on the Planquemine canal, or on other ground in the vicinity of New Orleans, where there are neither stones or roots, that is all which can be expected from it, and would suffice to establish its character for use in similar situations. In the absence of all evidence upon the subject, we, however, are apprehensive that the throwing off the dirt at the proper time, and

the causing it to arrive upon the sloping roof, down which it is to fall, will be attended by some difficulty.

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8. For an improvement in the mode of *Manufacturing coarse Salt from salt water;* Aaron Barnes, Deerfield, Oneida county, New York, September 7.

A boiler of iron or copper, which is to be the frustrum of a cone, is to be fixed horizontally. This boiler may be twenty-two feet in length, three feet in diameter at the larger, and two feet six inches at the smaller end. It is to be surrounded by a flue, a furnace being placed in front of it, that is, at the smaller end; the heat from the furnace is carried under the boiler, and returned back above it to a chimney at the front. The boiler is to be supplied with salt water through a tube, which reaches nearly to its bottom, conducting the cold water into the most heated part at the front. The back end of the boiler opens into a *boiling vat*, which may be a wooden vessel, twelve feet square, and five deep. This vat is to be closely covered to prevent the escape of steam. A *settling vat* forty feet long, twelve wide, and two deep, is placed below the boiling vat, so that the concentrated salt water may be drawn off from the latter into the former. A salting, or *crystallizing vat*, 140 feet long, twelve wide, and one deep, may receive the brine from the settling vat.

Tubes from the boiling vat convey off all the steam generated and carry it under the settling and salting vats. These tubes, widened out, make a part of the bottoms of the vats, and thus convey the heat of the steam to the brine. When additional heat is required other similar tubes from independent boilers may be employed to supply it.

By this arrangement, coarse salt, it is said, is rapidly formed in the salting vat, and both labour and fuel saved.

The claim is to the arrangement of the utensils, and their application to the purposes, and in the manner, specified.

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9. For an improvement in the *Material, or manufacture, of the Surgical Instrument called the Pessary;* Joseph Warrington and William Scattergood, Northern Liberties, Philadelphia county, Pennsylvania, September 5.

The material to be employed is glass, which from its power of resisting corrosion, is not acted upon by those secretions to which the instrument is subjected when in use. The pessary is to be made in all the variety of forms which may be required, and is in general to be blown hollow, to insure the requisite lightness.

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10. For an improvement in the *Machine for Breaking Hemp;* William Stone, jr., Williamson county, Tennessee, September 8.

This is the old fashioned Dutch break; but the patentee says that he makes an additional set of teeth across the jaws of the break. The upper jaw is to be raised by cams, or lifters, upon a shaft, and the teeth, as well as the whole machine, we are told, may be made larger or smaller.

The patentee claims the mode of applying the power, as well as the additional teeth. We do not perceive what there is new in the mode of applying the power; the additional teeth, may, possibly, add something to its utility.

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11. For *Making Rope and Cordage of all kinds, by machinery;* William Stone, jr. Williamson county, Tennessee, September 8.

By means of the machinery described in the specification, the hemp, or other material, is to be converted into laid rope, by a continued operation. We shall not attempt to describe the apparatus employed, as this would be of little avail without drawings; nor do we think it necessary, as several patents have been obtained in this country for machines operating upon the same principle, and similar machines are in use in England. The principal object proposed is the twisting and laying at one operation, and the patentee says that this may be effected by means of his machinery, not only on small cordage, but also on the largest ships' cables. That he can thus manufacture cordage and ropes of a moderate size, we are well aware; but large ships' cables would prove to be untractable affairs to twist about and whirl round in the manner required.

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12. For a *Washing Machine;* Wilson Gregory, city of Richmond, Virginia, September 9.

This is a rectangular box, with gudgeons on two of its ends, and a crank by which it may be made to revolve. On one side is an opening, and a closely fitting door, and at each of the four longitudinal angles within the box are fixed four rollers, which give its interior an octagonal form.

The claim is to the foregoing machine, and particularly to the rollers, to prevent the clothes being injured by friction.

Will not some ingenious *inventor* add a roller at each angle, and then take out a patent for his improvement?

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13. For an improvement in the *Bee Hive and the art of managing Bees;* Eben Britton, Littlefalls, Herkimer county, New York, September 9.

We do not think it necessary to enter into a detailed description of the construction of this hive, or of the particular manner of using it. It consists generally of three boxes, which may be placed one upon the other. Each of these is divided into two compartments, and they are furnished with slides which open and close apertures leading from one box, or compartment, to another, the object of which is so to manage the bees that the contents of the upper box, and of smaller boxes, which are occasionally applied, may be obtained without disturbing the bees.

The patentee appears to think the whole arrangement new, as he claims "the entire art of managing bees as herein described; together with the bee hive and its component parts, as constructed; ex-

cepting only the small boxes placed at the top of the first or uppermost box, the four cross sticks in the main part of each box, and the mouth or orifice in front of the same."

Boxes have been repeatedly placed upon each other, and sliding pieces have been applied to open and close the communication between the various compartments of hives so constructed, and, of course, a management of the bees very similar to that of the present patentee has been adopted. In the last number at p. 133, we had occasion to notice an arrangement of hives very similar to the present in its general principle.

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14. For an improvement in *House, Ship, and Camp Furniture;* Edward Clibborn, Cincinnati, Hamilton county, Ohio, September 12.

An extended description is given of the various applications of this improvement to bedsteads, cots, lounges, easy chairs, and various similar articles, and this is accompanied by forty-four drawings, or sketches, intended to illustrate these applications. The object proposed is to obtain greater elasticity than ordinary in the bottoms of such furniture. For this purpose oval frames are to be made of hickory, ash, whalebone, iron, steel, or any other elastic substance. These frames form elastic hoops which may be joined together by rivets, bands, hinges, or otherwise. Over these frames, ticking, netting, or other material is to be stretched and secured to the hoop. The threads, if cloth is used, are to extend obliquely, or biasing, and it is not to be strained so as to destroy the elastic action of the hoop or frame.

Cots, or bedsteads for invalids, may have hinges placed upon the upper or lower sides of the oval frame, to allow the bottoms to be elevated or depressed in the manner of such as have been used in hospitals and elsewhere.

The patentee calls the furniture, so made, *atmospheric furniture*, because persons reclining on bottoms of this description may be exposed to the action of air on every side.

There is no particular claim made, but the general nature of the thing intended to be patented is made sufficiently obvious.

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15. For an improvement in the mode of *Raising Ships, or other Vessels, Canal or Steam-boats, Sloops, Schooners, &c.*, weighing anchors, discharging cargoes, hoisting goods in stores, raising and removing buildings, and all kinds of heavy burthens, and used as a compressing machine, known and distinguished by the name of the "Elevating Power Engine and Compressing machine;" Benjamin Bruff, Rochester, Monroe county, New York, September 13.

In addition to the purposes named in the above title, to which, it is said, this machine may be applied, there is afterwards added the raising of mineral coal, and *weights to propel boats or mills.*

The machine consists of three or more levers of the first kind; these

levers are to be fixed in a frame, side by side, as they are to operate simultaneously. When used for raising ships or other vessels, the extreme ends of the levers are to be passed under the vessel, or they may pass over the deck; in which case, iron chains or braces are to pass from them round the keel. When the vessel is thus secured, a double windlass, situated below the longer ends of the levers, is used to draw them down, and raise the vessel.

The levers, we are told, may be about forty feet long, and, as shown in the drawing, the fulcrum is about one-fourth of that length from the boat; to raise a vessel five feet, the other end of the lever must, therefore, be depressed fifteen. What then must be the length of a lever to raise a ship? It is really strange that any one should expect to accomplish such a purpose by means so totally inadequate; but the climax is capped by the proposition to raise weights to propel boats or mills; the absurdity of the original design is scarcely to be noticed alongside of this new intention.

Another gentleman of Rochester, Mr. William W. Smith, obtained a patent for a machine altogether similar, excepting that the levers were to be drawn down by screws, instead of by a windlass and rope; the specification of this patent may be found at p. 301, vol. v. with some remarks of ours respecting it.

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16. For an improvement in the mode of manufacturing *Steel Forks*, called "Goodyear's Steel Forks;" Charles Goodyear, city of Philadelphia, September 7.

The patentee proposes to make steel pronged forks, with iron shanks, without splitting the steel in forming the prongs. Steel is to be taken of proper size for forming the prongs; and for a two pronged fork this is to be laid upon an iron bar, about two inches from its ends, the steel at right angles with the iron, and extending each way far enough to form a prong. The end of the iron bar is then to be bent over, and cut off even with the short piece. After forming the prongs by pointing and bending, the iron is to be welded and drawn out to form the shank.

When there are to be three or four prongs, the process is to be so managed as to admit of their formation on the same principle.

The fork, when completed, is to be dipped in melted tin, until it is coated with that metal.

The claim is to the manner of putting the materials together, without splitting the steel bars, and to the tinning of the forks.

The blacksmith must judge respecting the novelty in the proposed manner of making forks, as upon this depends the validity of the claim. For ourselves, we should have supposed that any intelligent workman who happened to have a steel rod the right size for prongs, would readily resort to such a mode of using it, without exhibiting any more of invention than is daily called for in the pursuit of his business.

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17. For an *Anthracite Cooking Stove;* Walter Bryent, Boston, Massachusetts, September 13.

The stove is to be made of cast iron, and the anthracite is to be burnt in a grate of the ordinary construction, but besides the front bars, the grate is also to have perpendicular bars at the back to admit of a draft through the fire to, and round, an oven, which stands behind the grate. Dampers are to be provided to regulate the draft; a boiler is to be placed directly above the fire, and a larger one above the oven; tubes from these boilers are to conduct the steam into another tube leading directly under the furnace, that it may pass into the fire.

The parts considered as new are not designated, no claim being made; there is a drawing, but it is without written references.

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18. For an improvement in the *Water Wheel, and the application of Water thereto;* Joel Eastman, Bath, Grafton county, New Hampshire, September 28.

(See specification.)

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19. For *Manufacturing Shovels, or Scoops, from sheet iron, copper, zinc, or any other metal;* Mordecai Bull, Greenwich, Washington county, New York, September 28.

A cast iron bed piece, of the proper form, with a follower to fit into it, and which is to be forced down by means of a lever, constitute the apparatus used. The sheet metal is to be forced between the follower and bed, into the required shape.

This kind of machinery is too well known to be the subject of a patent, it must therefore be intended to claim the applying it to the manufacturing of the particular articles in question, a claim of very doubtful validity.

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20. For a *Thrashing Machine*; Thomas Carpenter, Elmira, Tioga county, New York, September 28.

Instead of the cylinder usually employed, a wheel of pine boards is to be made of about five feet and a half in diameter. This is to be strengthened on one side by a rim of oak; on the opposite side are to be fixed strips of wood, armed with iron, which constitute the beaters, of which there may be sixteen or eighteen, radiating like the spokes of a wheel. The wheel thus prepared is to be fixed vertically in a frame, like a grindstone, and between it and a facing fixed to the frame the thrashing is to be effected. The facing, which answers the purpose of the ordinary segment, is to be made into ridges, and to have strips of iron to strengthen and defend it. A band and whirl may be used to give motion to the wheel.

The patentee says, "What I claim as my improvement in the thrashing machine is, that a wheel of this size and form requires only about five hundred revolutions in a minute, and will make as good work and as expeditious as the cylinder machines that require from fourteen to sixteen hundred." This certainly is not a very felicitous manner of presenting the claim.

21. For a *Thrashing Machine;* Ezra Wickwire, Alexander, Gennessee county, New York, September 28.

The cylinder of this machine is the only part claimed, and upon what ground it would be no easy task to tell; there are no precise directions given respecting it, but, on the contrary, a general latitude of construction is proposed, embracing several old and well known plans. The cylinder may be of wood or of iron, either cast or wrought, the beaters may run either straight or diagonally, and their number may vary as you please. The concave may be placed either above or below, and may be made like the cylinder, or as you like it.

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22. For a *Shingle Machine;* Cheney Reed, Worcester, Worcester county, Massachusetts, September 28.

A cast iron wheel is to be made to revolve horizontally in a suitable frame; a knife, or shave, which is in segments, forms a circular cutter on the under side of this wheel. There are to be two circular platforms which also revolve upon vertical shafts underneath the cutter wheel, one on each side of its shaft, their peripheries approaching each other as nearly as the shaft of the cutter wheel will allow. Upon the upper surfaces of these platforms are pieces which serve to gripe the shingles to be shaved; the bed upon which the split or sawed shingle lies has a sufficient inclination to give to it a thick and thin end. The dressing on one side is effected on one of the platforms, and the shingle is then removed to the other platform, which finishes the other face, each of these platforms carrying the shingle under the revolving cutter. From the upper side of the cutter wheel project out four knives, or clearers, which serve to cut and remove the shaving, as this, from its width, might otherwise obstruct or choke the machine.

The claim is to the circular rotary shave, and the circular rotary carriages, or platforms.

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23. For a *Spring Door Catch;* James Buck, Bucksport, Hancock county, Maine, September 28.

This is a very simple contrivance, consisting of a bolt, spring, and knob, or knobs. The bolt is to be let into the edge of the door by boring a hole of sufficient depth. A straight spring, let into the edge of the door under the bolt, and covered by a plate, forces the catch forward. Knobs, or handles, like those upon the spring bolt of a lock, turn in the usual manner, a projection, or pallet, upon the shank serving to push the catch back.

There is no claim made, and no further room for one than is furnished by a trifling variation of form from such bolts and catches as have been in common use.

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24. For a *Churn;* James Van Auken 2nd, Knox, Albany county, New York, September 28.

An upright churn has within it two vertical shafts which are made

to revolve and carry dashers; there is a cog wheel taking into pinions on the top of the two vertical shafts, and by turning a crank these are set in motion.

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25. For a *Suction and Lifting Pump;* Elisha Tolles, Litchfield, Litchfield county, Connecticut, September 28.

This patent is taken for the particular arrangement of the different parts of this pump without a claim to any thing new in its principle. The tubes, chamber, and other parts, are to be of metal. The chamber is to be low down in the well, and the piston rod is to descend through a tube which operates as an air vessel, the rod working through a stuffing box at the top of it. A rising main, or delivery pipe, extends up, entering the side of the chamber at its upper part. The piston is to be of metal, with a leather stuffing. The mode of making it is particularly described, but we do not perceive in it any thing rendering it superior to some others already in use.

One object in placing the chamber low down is to avoid danger from frost; the water, however, in the rising main is as much exposed as usual.

Although called a suction and lifting pump, it is, in fact, a forcing pump.

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26. For an improvement on the mode of *Applying Rollers for the reduction of friction in axles*, &c., as first patented January 27, 1830; Isaac Cooper, Baltimore, Maryland, September 28.

This is a modification of Garnett's friction rollers. Upon the end of the axle of a rail-road car, a plain metallic ring is to be placed. Friction rollers which revolve on their axes surround this ring, exactly as they surround a gudgeon on Garnett's plan, as this ring is in reality nothing more than an enlargement of the gudgeons. The outer peripheries of these rollers press against a semicircular metallic arch upon the frame of the car. The claim is to this arrangement.

This, in principle, is essentially the same as Garnett's rollers, although presented under an arrangement somewhat different from his, but not, as we perceive, affording any advantage over the old form.

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27. For an improvement in the *Application of the Power of Wind to Mills*, Factories, Boats, or Vessels, Pumps, and all kinds of Machinery; John Y. Van Tuyl, Rahway, Essex county, New Jersey, September 28.

This wind wheel is to revolve horizontally, being sustained and balanced on a shaft passing up through its centre into a cavity on the upper side of it. Its periphery is surrounded with buckets something like those of a water wheel, but pointing, as radii, to the centre. The wind is to be made to act upon the buckets by means of what are called funnels, which are to direct it upon them obliquely. To form these funnels two rims are made like the rims of a water wheel; their interior diameters being such as to receive the top and bottom board of the wind wheel, and allow it to

revolve within them. Pieces, like floats or buckets, are to be placed between these rims, the same in width and number as those in the wind wheel; they are not, however, so arranged as to point to the centre, but stand nearly at right angles to the buckets of the wind wheel. The outer rim thus made forms the funnels through which the wind is to blow upon the wind wheel; a certain number of the funnels receiving and directing it on to the floats, whatever may be its direction.

There are to be doors to the openings of the funnels, in order to close any number of them when the wind is too powerful. The claim is to the improved manner of applying wind as described.

The specification is very far from being clear, and the drawing, although well executed, is without written references, and does not represent some of the parts described; we think, however, that we have not mistaken the views of the patentee, although we are very far from entertaining the same hopes upon the subject which have been his prompters; we anticipate but little advantage from the use of his invention. The proposition of applying the said wind wheel to boats, and other vessels, is most absurd, as all the power which goes to move the wheel will be expended without producing any action upon the boat. Should the wind be ahead, the boat will go astern with a little less rapidity than it would were the wheel locked fast; and should the wind be fair, the greatest advantage will be taken of the wheel by preventing its revolution altogether, and allowing it to act merely as a sail, although it will be one of a very inferior kind.

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28. For a mode of *Constructing Mill Stones*, for grinding grain, hulling clover seed, &c.; Benjamin Myers, Chambersburg, Franklin county, Pennsylvania, September 28.

The lower stone, which is about two feet in diameter at the bottom, is to be the runner; its shape is conical, the sides forming an angle of about fifty-five degrees, until they are about nine inches in width, when they pass to an apex at an angle of twenty degrees. The bed stone, which is supported upon a frame above the runner, is hollowed to receive it, and has an eye through its centre; this stone may be six inches more in diameter than the runner, and about fourteen inches thick.

The claim is to the form of the bed stone and runner.

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29. For an improved *Chair, or Hospital Bedstead;* Williams Woolley, city of New York, September 28.

A narrow bedstead is to be made in the form of the four post bedstead, but so constructed as to be capable of being readily converted into an easy chair. The bottom is to be divided into three parts, the centre one of which is to be stationary, but the upper part is capable of being raised by a crank and pulleys so as to form the back of the chair, whilst the lower, or foot part, is capable of being let down to

form the front of the chair, as it may then stand at right angles with the stationary part, which now forms the seat.

There are contrivances which answer as arms to the chair, and some other appendages not requiring particular notice. There is no claim made to any of the parts described, which appears to us to be a serious omission, as bedsteads, or couches, have been constructed which are capable of being raised and lowered much in the manner of that before us, and we ought, therefore, to have been informed what is new in it.

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30. For an Economical *Baker and Roaster;* Philip Wilcox, Springfield, Hampden county, Massachusetts, September 28.

The action of this apparatus, and indeed its whole construction, so nearly resembles the ordinary tin kitchen, as to need but little description. The upper part is to be of sheet tin, arched, to reflect the heat. Moveable sheets of tin are to be placed below the meat, sloping from the front towards the back at an angle of forty-five degrees.

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31. For *Self-guiding and accommodating Cars for Railways;* Levin Clark, Baltimore, Maryland, September 28.

To this car there are to be six wheels; the two fore wheels are attached to a frame separate from the main frame of the car, and capable of varying its direction so as to allow the wheels to deviate and adapt themselves to any curve. From this frame a connecting bar leads back to the axle of the next pair of wheels, and the apparatus is so arranged as to change the direction of these so far as to cause the three wheels on either side to run upon the required curve. The particular arrangement by which it is proposed to effect this object cannot be described without drawings. The locomotive engine is to be provided with two cylinders, each of which is to operate upon one of the remaining pair of wheels through the medium of distinct cranks. It is intended by this means to give different velocities to these wheels, corresponding to the curves over which they are to pass. How this is to be effected with the necessary precision we are not informed, and cannot tell. The steam engine is a very manageable instrument, but, we apprehend, not so perfectly controllable as this proposition would indicate.

The claim is to "the principle of *working two cylinders with one head of steam*, and the principle embraced in the *coupling or gearing*, by which the wheels will arrange themselves on the different radii of the tracks."

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32. For the application of *Horse and other Animal Power, to move Machinery;* George Page, Keene, Cheshire county, New Hampshire, September 28.

There may be something very new in this horse power machine, but we have not yet found it out. An endless band is to pass over two cylinders placed at a proper distance from each other to allow the upper side of the band to form an inclined plane upon which a

horse may walk. The band may be made of stout leather, and be covered with slats of wood bolted to it. Proper friction wheels sustain the slats, or floor, and run upon iron ways.

The claim is to the "application of horse power to move machinery for sawing wood, propelling boats, &c. &c. by an inclined band operating in the manner above described.

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33. For a *Grist Mill;* Ezra Brees, Kingston, Luzerne county, Pennsylvania, September 28.

The claims made by the patentee of this portable grist mill, are to the running of small stones about 400 revolutions in a minute, without pressure or artificial weight; the mode of preventing their heating; the manner in which the spindle, balance rine, and driver are made, &c. &c.

The particulars claimed are not clearly described, or plainly shown in the drawing; enough, however, is seen to prove that some of the points supposed to be new, are not entitled to this character.

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34. For *Machinery for Cutting and Punching Iron and Steel;* Jedediah Richards, Elbridge, Onondaga county, New York, September 28.

A bar of iron is bent round like spring shears, and one side of this bar is to be fastened to a bed piece of stout wood. The die against which the cutter or punch acts is fixed upon the lower side of the bar, near its end, and the cutter, or punch, is fastened to the other end above the die. A lever, with a long arm, is secured by straps, or cheeks, of iron, so as to act upon the two ends of the bent bar, and this lever, when depressed, forces the punch or cutter down by the power of its short arm. The bow of the bent bar serves as a spring to raise the punch, or cutter, when the power is taken off.

There is no claim made, nor do we perceive any thing upon which one could be fairly founded, excepting it be the mere bend in the bar acting as a spring; this arrangement is probably new.

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35. For an improvement in the *Re-acting Steam Engine;* Ambrose Foster, Brutus, Cayuga county, and William Avery, Salina, Onondaga county, New York, September 28.

In this engine, the steam is to issue from the opposite sides of revolving arms, as the water does from the rotary trunk of Barker's mill. The oldest steam engine known, that of Hero of Greece, acted upon this same principle; and numerous others have been constructed in modern times, which were to operate in this way. The present patentees do not pretend to be the inventors of this kind of engine, but to have devised such improvements as they believe will render it more efficient than it has hitherto been.

It is intended that the arms shall revolve within a drum or case; from this a tube is to conduct off the steam, a portion of which, when condensed, will serve, in part, to supply the boiler. The improvement relied on by the patentees consists in making the revolving tubes flat, instead of round, that they may be subjected to but

little resistance from the atmosphere. They say that "in an engine which we have in actual operation, the arms are each twenty inches in length. The width of the arms at the centre is about six inches, and at the ends about two inches and a half. In depth, or thickness, they are about one inch and a half near the centre, and about three-fourths near the end. The size of the holes through which the steam escapes, is about one-fourth by one-eighth. The holes are so perforated that the steam shall issue at right angles with the shaft."

"We find it to be a point of great importance to give such a form to the revolving arms as shall subject them to the least possible resistance from the air; we, therefore, instead of making them in the form of round tubes, which has been heretofore done, give to them the form which results from making each half of the arm a segment of a large circle; so that when the two halves are united, the edges of the tube present acute angles. The tubes, however, may be made elliptical, or oval, and the same end will be in a great measure attained. We use any number of such arms on the same shaft, as we may find best adapted to our purpose."

"We do not claim to be the inventors of the reacting steam engine, nor of the case, or drum, within which we intend the arms shall in general revolve; but what we claim as our invention is simply the giving the oblate or flat form to the revolving arms, so that in proportion to their capacity they shall experience much less resistance from the air than that to which they have been heretofore subjected, thereby obtaining a greatly increased power."

We have been induced to give more room to the notice of this engine than we should otherwise have done in consequence of the information contained in a letter recently received from one of the patentees, that it had been in continued use ever since the issuing of the patent, in a factory owned by him, and had fully justified all his anticipations.

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36. For an improvement in the *Apparatus for Distilling Spirituous Liquors;* Lemuel Wellman Wright, a citizen of the United States, now residing in London, England, September 28.

This apparatus consists principally of an alembic, a rectifying cistern, and a refrigeratory, each of them having something peculiar in its construction. In the body of the still there is to be a plate of copper which may be fifty feet long, and a foot wide, bent into a helical form, like the main spring of a watch, which is to be fixed upright on the bottom of the still, forming a spiral channel from its centre to its sides. The liquid to be distilled falls in a continued stream into the centre of this coil, and in its circuitous rout to the discharge cock, is to be deprived of all its alcohol. Instead of a spiral, the plate may be bent in a zigzag, or other, manner.

The wine, or wash cistern, is fixed above the rectifier, and the liquid passes from one to the other through a regulating cock, and falls upon a copper tray-like shelf, perforated with holes, and through

these it passes, in a fine spray, on to successive shelves, in a similar manner. The vapour from the still passes into this rectifier, and not only heats the wash, but subjects it to a steam distillation. The vapour which is thus formed escapes through a tube into the refrigerator, where it is condensed.

A self-regulating apparatus is employed to govern the admission of the wash, and the temperature of the rectifier; this regulator operates upon the principle described in Mr. Wright's patent for a "heat governor," of which we gave some account in the last number, p. 110.

The patentee states that he does not claim any of the known mechanical parts described by him, separately, but the combined and improved arrangement as set forth in his specification.

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37. For *Rendering Tin Plate more durable when used for various purposes, by Coating it with Lead;* Joseph M. Truman, city of Philadelphia, September 29.

(See specification.)

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38. For a *Machine for the Manufacture of Barrels,* Tubs, and other Cooper's ware; John Cole, of Belpree, Washington county, and Samuel Miller, of Athens, Athens county, Ohio, September 29.

This machine is intended to perform the various operations of shaving the staves and hoops, jointing the staves, turning and dowelling the heads, dressing the ends of barrels, cutting the croes, and facing the heading.

Any adequate power is to be applied to give motion to the machinery, through the intervention of cog wheels, drums, and other gearing. Three are to be fixed cutters through which the staves, or hoops, are to be forced by rollers. The jointing is to be effected by means of a knife, somewhat in the shape of a V, but with a much more obtruse angle; this knife is to be bent into the proper curve, and fixed across a frame working in cheeks like a saw frame; the stave is to be held down upon a suitable bed piece, and is then jointed by the descent of this knife, which must be equal in length to that of the stave. Such a knife, applied to the same purpose, formed a principal feature in a patent noticed by us a few months since. The part for shaping the heads, is a kind of lathe; and the dressing the ends of the barrel, and forming the croes, is also effected by revolving cutters.

The claim is to "the above described machine," which would be very well was it new in all its parts, but this is not the case.

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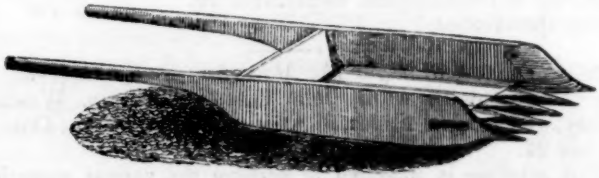
39. For an improvement in the *Bark Mill;* Charles H. Green and Richard Montgomery, Sangerfield, Oneida county, New York, September 30.

The general construction of this mill is that of the cast iron bark mills most commonly used. The improvements claimed are principally in the knives and ridges for breaking the bark; to these, such

a form is given as the patentee thinks will be most effectual in attaining the end proposed. Besides the particular formation of the parts mentioned, they also claim the "constructing the hopper and its several apartments and partitions entire, and of cast iron." By the hopper, in this case, is meant the exterior stationary box, or body of the machine, which has often been made "entire and of cast iron."

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an Excavating Scraper, being an improvement on the common scraper used for removing earth. Granted to DUDLEY MARVIN, *of Canandaigua, Ontario county, New York, September* 2, 1831.



To all whom it may concern, be it known, that I, Dudley Marvin, have invented an improvement in the scraper used for the removal of earth, for various purposes, which I denominate the "excavating scraper," and that the following is a full and exact description of my said invention.

Instead of the straight, cutting edge of the scraper, I substitute any convenient number of cutting shares, or points, as shown in the accompanying drawing. These may be of cast or of wrought iron, or of iron and steel; I prefer cast iron, however, as being the most economical. The sides of my scraper are armed with plates, or cutters of metal, which are brought out to a point corresponding with the shares, or cutters, before named, and are so formed on their edges as to cut and clear the earth in the most perfect manner. The body of the scraper I in general make of wood, in the usual manner, but I give a greater height to the sides and back than is ordinarily given, as it will carry a much greater load than the common scraper. In order to strengthen the wood, and to provide firm attachments for the cutting points, and runners upon which the scraper will advance with facility, I generally pass bars of iron across, both at the front and rear, whilst other bars, serving as runners, pass not only under the sides of the scraper, but may also extend from front to rear, from each of the cutting shares, or points. To these bars the points are attached by screw bolts, the heads of which are countersunk, and the nuts received in excavations prepared for the purpose, and therefore offering no resistance to the sliding of the scraper.

With an instrument of this description, earth may be excavated and removed, without the necessity of first ploughing the ground, the animal by which it is drawn, walks, consequently, upon firm ground, and the whole business is greatly facilitated.

What I claim as my invention, and for which I ask a patent, is the employment of cutting shares, or points, with the sides to correspond with them, operating upon the principle herein set forth and specified.

DUDLEY MARVIN.

Specification of a patent for an Inclined Plane Excavator, for excavating and removing earth. Granted to DUDLEY MARVIN, *of Canandaigua Ontario, county, New York, September* 2, 1831.

To all whom it may concern, be it known, that I, Dudley Marvin, have invented a new apparatus for the purpose of excavating and removing earth, which I denominate the inclined plane excavator, and that the following is a full and exact description thereof, reference being had to the accompanying drawings which make a part of this specification.

The carriage part of the apparatus need not be particularly described, as it differs from such as are in use in those points only which adapt it to the machinery for excavating and loading, to be presently described. The main principles upon which the operation of this machine depends, is the employment of an excavator of a particular construction, to plough, or break up, the ground, and the raising and delivering it into the car when thus broken, by means of an inclined plane formed by an endless apron, or aprons, kept in motion by a revolving roller, or drum.

Fig. 1.

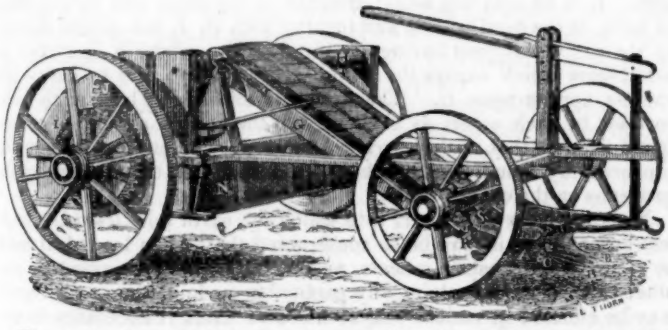
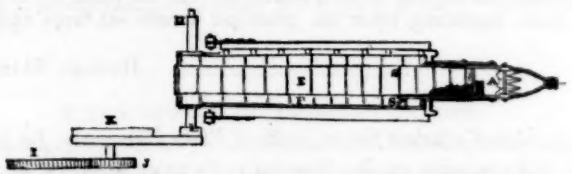


Fig. 1, in the drawings, is a perspective view of the machine; and Fig. 2 is a plan of the same, or rather of such parts as are required to be shown. A, is the excavator, or plough, for breaking up the ground; it is usually made of cast iron. The front or cutting edge of it is generally formed of pointed teeth, or shares, B, B, Figs. 1

and 2. The edges may, however, be made straight, or otherwise. Its under part, or sole, lies on the ground, like a shovel, and it has sides rising from it at right angles, or nearly so, as seen at C.

Fig. 2.



When the carriage is drawn forward, the plough, or excavator, is allowed to enter the ground to the required depth, this being regulated by the lever D, or by any suitable contrivance producing the same effect. The earth is delivered from the excavator, on to an endless apron, or endless aprons, at E, F. In the drawing, one of these aprons, E, is made narrow to receive the earth immediately from the excavator; this, at its lower end, passes over a roller appropriated to itself, immediately under the rear of the excavator as it rises from the sole, forming a commencement of the inclined plane. By this apron it is conducted up between the cheeks, or sides, of the excavator. The wider apron, F, when two are used, passes, at its lower end, round a roller extending across the inclined plane which it forms, and running in the cheeks G, G. At the upper end of the inclined plane, there is a drum, or cylinder, H, over which both the aprons pass, and from which they receive their motion.

The drum, or cylinder, above named, is made to revolve by a gearing connecting it with one of the hind wheels of the carriage. This may be effected in various ways, one of which is shown in the drawings. I, is an iron cog wheel attached to the inner end of the hub, or nave, of the hind wheel, and turning with it. J, is a pinion driven by the cog wheel, and having on its shaft the wheel K, a strap, or band, from which causes the drum, H, to revolve and to carry the endless aprons upon it. These wheels and whirls bear such proportions to each other, as shall give to the aprons a motion corresponding with that of the carriage, forward. The endless aprons are supported by a sufficient number of rollers under them, turning on gudgeons on the cheeks G, G.

N, is the body of the car, into which the earth falls from the endless aprons. This may be so constructed that, when loaded, it may be removed on separate wheels, and have its place supplied by another car. I do not claim any particular mode of doing this, as it may be effected in various ways; nor do I think it necessary to exhibit, or describe, those parts which are of minor importance, as every workman would vary these according to his own judgment or fancy.

The inclined plane is hinged to the carriage to allow it to rise and fall by the action of the lever D. In the strap of the hinge fastened to the cheeks of the inclined plane, I usually make slots in which the screw bolts are allowed to slide, for the purpose of tightening the aprons when requisite.

Fig. 3, is the inside of one of the cheeks; it has through it a slot, or mortise, there being a corresponding one on the opposite cheek. Into these slots, pass iron pins, projecting laterally from straps of iron attached firmly to the lower end of the wooden cheeks of the inclined plane. The play allowed by these slots, admits of a free motion of the plough to a certain extent, either up, or down, or longitudinally. It can, consequently, be depressed, according to the depth of hold which it is intended to take in the ground, or raised, until checked in a way to be presently described. The plough, by this mode of attachment, adapts itself also to its varying position in the draft.

Fig. 3. *Fig.* 4.

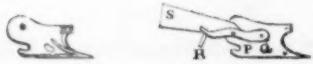


Fig. 4, is the outside of one of the cheeks. To this is attached a strap, or stop, P, by means of screw bolts Q, Q, or otherwise. When the plough is raised by means of the lever D, the end of the strap is brought into contact with the iron bar R, when a further action upon the lever will raise both the plough and the inclined plane.

S, Figs. 1 and 4, is a piece of sheet metal, playing freely around a bolt seen in Fig. 4; there being provision made between the strap P, and the cheek for that purpose. This, or rather these pieces of metal, serve to guide the earth as it passes from the elevated part, at the rear of the plough, until it arrives, or is delivered, on to the wide apron. Its rising and falling freely, prevents it from being affected by the varying inclinations of the plough, and allows its lower edge always to remain in contact, or nearly so, with the apron. The ends of these plates are seen at S, S, Fig. 2.

I have herein described the general construction of this machine, and have pointed out various particulars in the arrangement of some of its parts without intending, even where they are new, to claim them as making any part of my invention, as the same end may be attained in other ways, without altering the main principle upon which the action of my inclined plane excavator depends.

It will be seen that the above principle is applicable to the formation of trenches for the foundation of rail-roads, and also to the digging of ditches; the principal alteration necessary in these cases, being the constructing of the apparatus in such a way that the plough and inclined plane may descend to the required depth below the ground on which the wheels rest. I also contemplate the using it for the deepening of harbours, canals, and other waters; in which case, a boat, scow, or other suitable vessel, may be substituted for the wagon, or carriage, on land; the requisite power may be obtained from a steam engine, or other means, according to the nature of the labour to be performed.

In applying it to the digging of ditches, or trenches, the apparatus may be so modified that, instead of loading the earth into a cart, it may be thrown on either side of the trench, or ditch, when it is de-

sired to form a bank. Every competent machinist will at once perceive that practical modes of effecting these ends are easily devised, and that they may be modified in various ways, whilst the principle of elevating by the inclined plane, is still preserved.

What I claim as new, and for which I ask a patent, is the delivering the earth from the plough, or excavator, as above described, on to an endless revolving apron, or aprons, forming an inclined plane; and by such apron, or aprons, to carry the earth up so that it may be delivered into a car, or other convenient receptacle, or deposit it upon the ground upon the principle hereinbefore described; that is, by the use of the said revolving endless aprons.

DUDLEY MARVIN.

Specification of a patent for an improvement in Water Wheels. Granted to JOEL EASTMAN, *Bath, Grafton county, New Hampshire, September* 28, 1831.

(WITH A COPPERPLATE.)

To all whom it may concern, be it known, that I, Joel Eastman, have invented a new and useful improvement in the construction of water wheels, and the application of water thereto, and that the following is a correct description thereof.

To a vertical or horizontal shaft I attach two or more floats made of wood or iron, their proper proportions being about two feet long and one foot wide, making a wheel four feet in diameter and one foot long. This wheel is enclosed in a tight curve or case, fitting the wheel closely, and making part of a close trunk, or penstock, extending from the flume into the dead water at the bottom of the fall.

Should the necessary power and motion require it, two or more wheels may be attached to the same shaft, each wheel having its water conveyed to and from it separate from the others. For a vertical shaft there should be a penstock or close trunk, extending as high as the opening for the escape of the water from the upper wheel, and into the water at the bottom of the fall, into which penstock the water passes through an opening from each wheel, each opening being not less than five times as large as that by which the water is admitted into the wheels.

What I claim as my invention is a water wheel, or wheels, constructed in the manner above described, being enclosed in a case, the case being connected with, and forming part of, a tight penstock, or flume, extending the whole height of the fall, and the application of water to the wheel in the manner explained, however the same may be varied in practice.

JOEL EASTMAN.

Explanation of the Drawings. (Plate 3.)

Fig. 1, is a bird's eye view of the wheel and its curve, or case, with the openings for the admission and discharge of the water; the top,

Fig. 1.

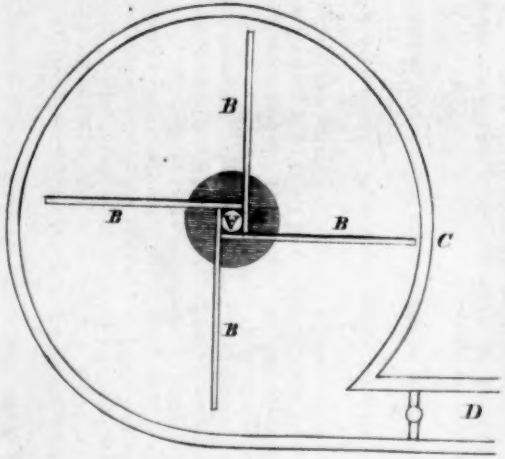
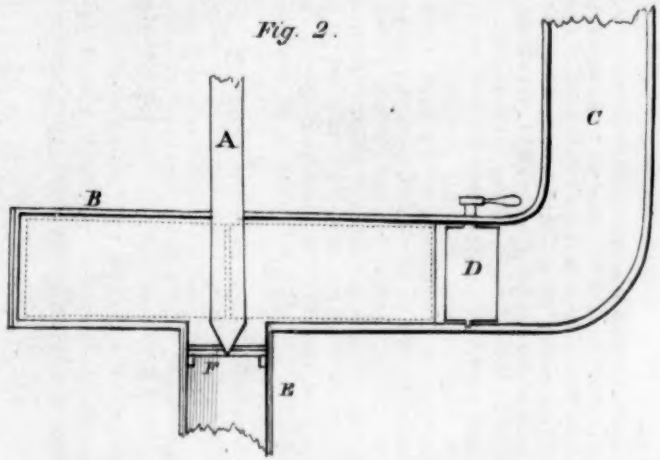
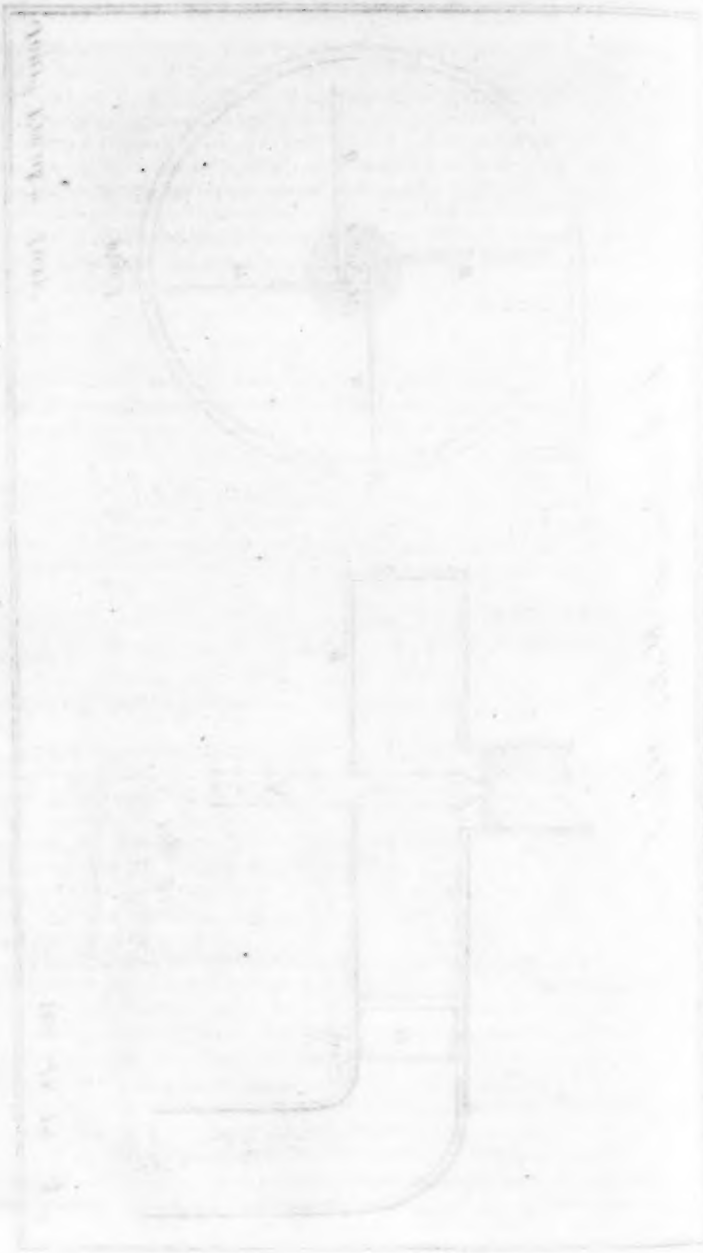


Fig. 2.



J. Eastmans Water Wheel



or cover, of the case being removed for the purpose of showing its interior.

A, is the shaft to which the floats are attached.

B, B, the floats, which, in width, are equal to the depth of the case.

C, the edge of the curve, or case, the inside of which is not a circle, but is so formed that the ends of the floats approach more nearly to it as they pass round from the aperture for the admission of water, and almost touch it when they again arrive at it.

D, the aperture for the admission of water on to the wheel.

E, the opening through the bottom of the case into the descending trunk through which the water escapes.

F, the gate or valve to regulate the flow of water on the wheel.

Fig. 2, is a vertical section of the case, a part of the trunk, &c.

A, the shaft, passing through the cover, and giving motion to the machinery.

B, the case, or cover, the dotted lines within which show the floats.

C, the tube, or trunk, through which water is admitted on to the wheel.

D, the gate, or valve.

E, the descending trunk, extending to the bottom of the fall.

F, a bar across, serving as a step to the shaft.

Specification of a patent for rendering Tin Plate more durable when used for various purposes. Granted to JOSEPH M. TRUMAN, *city of Philadelphia, September* 29, 1831.

To all whom it may concern, be it known, that I, Joseph M. Truman, of the city of Philadelphia, have invented a method of rendering tin plate more applicable to various uses than the ordinary manner of employing it with a simple coating of tin upon the iron, and that the following is a full and exact description of my said invention.

The purpose which I have in view is to preserve the iron more effectually from rust, and consequently to render the plates much more durable than heretofore, when employed for the covering of roofs, the making of pipes, gutters, cisterns, bathing tubs, and various other articles. In order to attain this end, I cover the tin plates with a coating of lead, by immersing them in a bath of that metal in a state of fusion. For most purposes, I dip the plates singly into the lead, after having dusted them with powdered rosin, or any other suitable flux, after which I unite them together in the usual way.

When required for gutters, I generally groove the sheets together, so as to form strips of convenient length; these strips are then passed through the melted lead; immediately from the bath I cause the strips to pass between one or more pair of rollers, which rollers may be made of wood, or of metal covered with several folds of cotton cloth, or other yielding substance: these rollers I keep greased with oil or tallow.

I have thus described the mode in which I usually effect the proposed object, but I do not claim the particular implements or method employed as making any part of my invention; but what I do claim, and for which I ask a patent, is the covering of tin plate with a coating of lead, and applying the plates so coated to the purposes hereinbefore set forth.

JOSEPH M. TRUMAN.

ENGLISH PATENTS.

Specification of the patent granted to PEREGRINE PHILLIPS, JR. *of Bristol, in the county of Somersetshire, Vinegar Maker, for an improvement in manufacturing Sulphuric Acid. Dated March* 21, 1831.

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said Peregrine Phillips, Jr. do hereby declare the nature of my said improvements is herein set forth and explained: but for the better understanding of the subject, I shall first describe the present mode of manufacturing sulphuric acid; next, the improvements I propose to effect; and then the means by which those improvements are effected. Sulphuric acid, or oil of vitriol, is generally manufactured at present by the combustion of sulphur, or brimstone, and saltpetre, either mixed together and placed in large leaded chambers, or separately in ovens connected with those chambers, into which chambers more or less of atmospheric air is admitted; the sulphur at first is converted by the combustion into sulphurous acid gas, and then, by the agency of nitrous gas, unites with oxygen from the atmospheric air in the chamber, or from that liberated from the saltpetre, and is thus converted gradually into sulphuric acid, which is afterwards absorbed by the water which covers the bottom of the chamber.

The first improvement then which I propose to effect, is an instantaneous union of the sulphurous acid gas with the oxygen of the atmosphere, and thereby to save the constant expense of saltpetre, and also the great outlay of capital in the chambers where any great quantity of sulphuric acid can be manufactured, by the gradual conversion of the sulphurous acid into the sulphuric acid. The second improvement I propose to effect, is to attain a more perfect condensation of sulphuric acid when made, by an improved mode of absorbing the same.

The first improvement then, namely, the instantaneous union of sulphurous acid with the oxygen of the atmosphere, I effect by drawing them in proper proportions by the action of an air pump, or other mechanical means, through an ignited tube, or tubes, of platina, porcelain, or any other material not acted on when heated, by the sulphurous acid gas. In the said tube, or tubes, I place fine platina wire, or platina in any finely divided state, and I heat them to a strong yellow heat, and, by preference, in the chamber of a reverbe-

ratory furnace; and I do affirm that sulphurous acid gas, being made to pass with a sufficient supply of atmospheric air through tubes as described, properly heated and managed, will be instantly converted into sulphuric acid gas, which will be rapidly absorbed as soon as it comes in contact with water. The sulphurous acid gas I cause to be generated by the combustion of sulphur or pyrites, or any other metallic sulphuret, in a close oven, having one or more apertures for the admission of atmospheric air, and another aperture leading to, or communicating with, the aforesaid tubes. The relative proportions of sulphurous gas and atmospheric air are regulated by the size and working of the air pump, which must pump out at least eighty-five cubic feet of air for every pound avoirdupois of sulphur consumed.

My second improvement, namely, a more perfect condensation of the sulphuric acid when made, I effect thus; I cause a chamber, or chambers, to be erected, of any size and materials that may be thought convenient, but by preference, of silicious stone, in a circular form, and about eight feet in diameter, and thirty feet high: this I cause to be lined, nearly, or throughout, with lead, to be filled nearly to the top with silicious pebbles, or any substance presenting an extensive surface, and not acted upon by the sulphuric acid. Upon the pebbles, or other substances, I place a sheet of lead pierced with small holes, for the better distribution of the liquor to be hereafter mentioned. The chamber is to be domed over, and rendered air tight on the outside, except by an opening on the top, through which a quantity of water, or dilute acid, is let in upon the pebbles to the height of about fourteen inches. A lead pump is fixed by the side of this chamber, drawing the liquor from its bottom, and emptying its contents into a lead funnel, placed in and over the aforesaid opening in the top of the dome, and which said pump is kept constantly worked by a steam engine, or any other power that may be preferred. The pipe of the funnel must be of such a size as always to keep some liquor in the funnel, and never to allow any air to pass down that way into the chamber; and the pump must throw a sufficient quantity of liquor to keep all, or the greater part of the pebbles moistened. A pipe, leading from the ignited tube, or tubes, after passing through some water for the purpose of cooling it, terminates in this chamber, just above the top of the liquor, whilst another pipe, going off from the top of the chamber, leads to the air pump, so that all the air charged with sulphuric acid, has to pass through the bed of moistened pebbles, which have a constant supply of water, or dilute acid, continually passing down them.

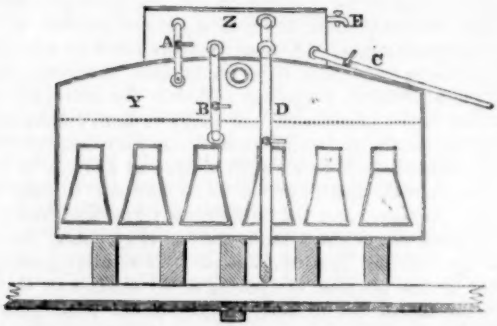
When the liquor is considered sufficiently charged, or when it will not absorb the sulphuric acid gas, which may be known by examining the air discharged from the air pump, it is to be drawn off by a pipe and cock in the bottom of the chamber, and treated in the usual way.

Note.—I do not claim a right to any mode by which sulphur or sulphurets may be converted directly into sulphuric acid by the action of heat or otherwise, if such method ever has been or ever shall be discovered; but I claim an exclusive right to any plan by which

sulphurous gas and atmospheric air, either alone, or mixed with any other gas or gases, shall be either forced or drawn by an air pump or any other mechanical means, through an ignited tube or tubes. I also claim the exclusive right to the use of platina in any finely divided state, for the purpose of assisting the action of heat in combining sulphurous gas with oxygen in the manufacture of sulphuric acid. I likewise claim an exclusive right to every mode by which chambers used in the manufacture of sulphuric acid, can be charged with silicious pebbles, or other substances, for the purpose of exposing extensive surfaces, and which surfaces can be either constantly or occasionally moistened by the liquor pumped or drawn from below them. [*Rep. Pat. Inv.*

Specification of the patent granted to SAMUEL SEAWARD, *for improvements in apparatus for economising Steam, and for other purposes.*

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said Samuel Seaward, do hereby declare that my improvement, or improvements, in apparatus for economising steam, and for other purposes, are fully ascertained and described as follows, reference being had to the drawing hereunto affixed.



I form a vessel, Z, of iron, or other suitable material, and capable of withstanding the heat of the steam contained in the boiler, Y, and of resisting the pressure of the atmosphere, and of a capacity equal to one-twentieth of the water chamber of the boiler, or thereabouts; this vessel I call a receiver, and it is to be placed on the said boiler, Y, as shown in the drawing, or any where near the boiler, of a sufficient height, that any fluid contained in the said receiver, will descend by its own gravity into the steam boiler. To this vessel I attach four cocks, or valves, and as many pipes, in the following order, viz. one pipe, A, from the top of the vessel Z, to the steam chamber of the steam boiler; one pipe, B, from the bottom of the said receiver Z, to the water

chamber of boiler; one pipe, C, from the bottom of the said receiver to the water outside the ship; and one pipe, D, from the top of the said receiver, to the well, or lowest part of the ship, in which the boiler is placed.

The first operation of this apparatus for the effecting the saving of fuel, is as follows:—When the steam is so high as to raise the safety valves and escape, either in consequence of the engines standing still, or the too great quantity of fire, the cock A is to be opened, and the receiver Z filled with steam, the air rushing out by a small cock E, placed at the top. The receiver being full, the cock A is to be shut, and also the cock E, and the cock C opened; the steam contained in the said receiver will, by this operation, be condensed, and a partial vacuum thereby be formed; the water will then rush from outside the ship, and fill the receiver; the cock C being then shut, and the cock B opened, the water will descend slowly, by its own gravity, into the water chamber of the boiler; and this can be accelerated by again opening the cock A, by which means the water will descend at a heat not much below that of boiling water. The saving of fuel will be evident, because at all times, the boiler may be completely filled, and the water itself raised to a high temperature by the steam, which would otherwise escape at the safety valves, and be completely lost.

The second operation is that of pumping, or drawing the water from the hold of the ship. To effect this, the cock A is again opened, and the receiver thereby filled with steam; upon closing the cock A, the cock D is opened, and the water will rush up from the hold of the ship, and fill the receiver; the cock D being shut, and the cock C opened, the water contained in the receiver will run overboard by opening the small air cock E in the top. This operation can be repeated till the ship is perfectly dry: fifty or sixty tons of water per hour can be discharged with great facility in a boat of 10 horses' power, by simply employing the spare steam while the engines are at rest.

Now having described my improved apparatus, I do hereby declare that I claim the same when applied to the boilers of steam engines employed on board packet boats, and other vessels, for economising steam, and for the other purposes hereinbefore mentioned but not when employed for any other purpose.

Observations.

The advantages to be gained by the application of this apparatus are two-fold:—*first*, the most perfect economization of the fuel, inasmuch as all the steam generated in the boiler, is applied usefully; and, *secondly*, the application of the steam power in a most simple and efficacious way, for the purpose of pumping or discharging the bilge water out of the hold of the ship or vessel.

Any one who has been in the habit of witnessing the steam vessels on the Thames, for instance, must feel satisfied of the immense loss of steam, and, consequently, the expenditure of fuel, occasioned by

the steam roaring out of the waste pipes in the abundant manner it is accustomed to do, previously to starting, while running, and at the end of the voyage; for it must be borne in mind, that all the steam so escaping is attended with actual loss, carrying with it a great portion of heat, at the same time that the passengers are inconvenienced by the great quantity of warm water and argillaceous matter falling upon the deck. By the adoption of the present apparatus, however, the loss and the nuisance are both avoided, for the steam, instead of being allowed to escape, is condensed; the heat is secured and returned again into the boiler.

To be able, therefore, at all times when there is the least particle of steam in the boiler, to fill it up with water the required height for starting, and also to discharge any quantity of bilge water out of the hold of the ship, and that in a very rapid manner, without the aid or intervention of pumps, or even setting the engine to work, are advantages of too great consequence to be overlooked. All these advantages considered, we may confidently suppose that this apparatus will be found of no common importance to the interests of steam-boat proprietors, by rendering their engines more extensively available, and thereby increasing the value of steam-boat property. The expense of such an apparatus complete for 100 horses' power, would, it is presumed, be about £100. [*Rep. Pat. Inv.*

Patent granted to WILLIAM MORGAN, *of York Terrace, Regent's Park, Esquire, for improvements in Steam Engines. Dated February* 14 1831.

THE discovery here is to produce a perfectly rotary motion from the action of a piston whose oscillation is but partial. Suppose the piston of a steam engine, particularly one of those for which Elijah Holloway procured a patent, oscillates within a cylinder, in a semicircular ation; or suppose it performs a greater or a smaller proportion of a perfect revolution. In this case it would be a manifest advantage, applicable to a variety of purposes, which engineers and mechanics will at once comprehend, to procure from this imperfect revolution of the piston, a perfect rotary motion. This may be done in several ways. By a chain, or strap, secured to a drum round the piston and to a beam, at the further end of which is a crank, two oscillations of the drum round the piston, and, relatively, of the beam, will complete a perfect revolution of the wheel at the end of the crank. The same effect may be produced by cog wheels in the drum and moveable beam, and by other means.

The improvement claimed by the patentee is, the production of perfect rotary motion from the partial oscillation of the piston of a steam engine. The means of producing this are various, and the patentee lays no claim to any express apparatus for the purpose. A beam attached to a knee, or joint, fastened on to the piston, and describing one portion of a circle, at the end nearest to the piston, and another

portion at its opposite extremity, may have a crank affixed to it in such wise, as to produce the same effect.

The improvement is evident, and the variety of its powers of application surprising. [*Rep. Pat. Inv.*

Notice of a patent granted to JAMES THOMSON, *Esquire, for improvements in making Printing Types. Dated February* 14, 1831.

AN indictment for arson charges the wilful fire-raiser with malice aforethought, and diabolical designs against our lord, the king, his crown and dignity; in that he, the aforesaid fire-raiser, did, at time and place aforesaid, with intent aforesaid, kindle many fires, to wit; two fires, &c. &c. with intent that the said fire should burn to the end of the world.

However true or false this description may be of the beginning of a fire, it is strictly applicable, changing malice into benevolence, to him who makes and publishes a useful discovery. However trivial in itself, its flame may burn to the end of the world: and as each passer by throws his portion to the flame, it augments incalculably.

Thus, the inventor of types of wood, would be astonished at the sight of fonts of metal, and the modern compositors were staggered when distinct letters were cast by a page at a time, in the shape of stereotype plates.

The present discovery would surprise the inventor of stereotype. It is to reduce the plates of metal back to single types; not, however, as the rupees and pagodas of India are struck from a silver sheet of the veda; but the necessary letters being first set up with wide spaces, and broadly "justified," as the compositors say—that is, widely divided between the lines, the mass is put into an iron box, and a plate cast thence, precisely as is the case with stereotype; the plate, however must be as thick as the type is to be long. By the operation of one or more circular or common saws, the plate is again subdivided into letters, which are used as types are. [*Ib.*

Notice of a patent granted to JEREMIAH GRIME, JR., *Copperplate Engraver, for a method of Dissolving Snow and Ice, on the Trams or Rail-ways. Dated February* 21, 1831.

MR. GRIME'S invention would effectually answer the purpose intended, provided he had been satisfactorily explicit upon one branch of the provisions required to bring it into action. This will be alluded to in its proper place. The main obstacle we anticipate, and which would occur to every reader of his specification, is the enormous additional expense that, upon its adoption, would accrue to the proprietors of the rail-ways. He proposes to lay by the side of, or under the trams, tubes, for the purpose of conveying steam or boiling water, which is to be prepared in boilers at equal distances of two

or three miles apart upon the road; each boiler to have a connecting cistern to receive the cold water from the hollow tubes or trams, with, of course, a feeder to supply them with the hot water or steam. The latter operation can be easily effected upon the principle of its expansive power; Mr. Grime, however, so far as we have examined and comprehended his plan, has not explained the mode in which he proposes to feed the cisterns with the cold water already in the tubes; that is, taking for granted that the tubes are already filled with cold water, how this is to be returned to his boilers for the purpose of being heated we are not told.

To allow for the expansion of the metal, he has provided "small copper sliding tubes, to be inserted in cavities formed in the joints to receive them, and in order to provide for a renewal of this sliding tube when it becomes so much worn as to leak. [*Ib.*

Notice of a patent granted to WILLIAM ALLEN, *London, Piano Forte Maker, for "improvements in Piano Fortes." Dated the 20th July,* 1831.

SINCE the introduction of cast iron frames for piano fortes, considerable expense has been incurred in drilling the holes for, and fitting in, the pins, by which the strings are brought to any required degree of tightness, and considerable difficulty has been experienced in making the tightening pins fit into the holes, so as to turn with facility, and at the same time to preserve their position, and the required tension of the strings. These objections to the cast iron frames Mr. Allen has remedied, simply by casting the two dove-tailed grooves along that end of the frame where the tightening pins are to be inserted, and driving pieces of wood of a corresponding shape to fill up the dove-tailed grooves, and to receive the turning pins. It is evident that by this ingenious and simple contrivance, the expense of manufacture will be diminished, and the instruments will be improved. [*Reg. of Arts.*

Notice of a patent granted to WILLIAM ALLTOFT SUMMERS, *Engineer, and* NATHANIEL OGLE, *Esquire, for their having invented certain improvements in the construction of Steam Engines, and other Boilers, or Generators, applicable to propelling Vessels, Locomotive Carriages, and other purposes. Sealed 13th April,* 1830.

THE steam boiler, or generator, described by the inventors in their specification of the above patent, and claimed by them as their invention, consists in forming the boiler of a number of tubes or cylindrical chambers, placed in a vertical position, having other smaller tubes, or flues, passing through them, for the passage of the hot air or ignited gas from the furnace below; the larger tubes or chambers

contain the water to be heated, and are connected together at both ends by horizontal tubes or pipes. The supply of water is forced into the vertical chambers by a force pump through the horizontal tubes at the bottom; and from the upper horizontal tubes, the steam is passed by a pipe off to the engine.

The inner tubes, or flues, form a complete passage for the heated air, from the furnace crosswise through horizontal tubes, and throughout the larger cylindrical chambers from end to end; the whole apparatus is surrounded by a casing of metal, by which the heated air is also made to pass up through the spaces between the outsides of the larger cylindrical chamber; whereby the water contained in them is exposed to a very much extended surface of heated metal, on both the insides and outsides of the cylindrical chambers.

The patentees state, that they do not limit their claim of invention to any precise form, as the tubes, or vessels, may be elliptical, or of any other convenient form which would answer the purpose; but they claim as their invention the placing of an inner flue, or tube, for the escape of the heated air, or gas, arising from the fire inside a larger tube or vessel, in a perpendicular position; the said inner flues running through the inside of the larger tube, or vessel, and out at the top, the larger vessel being also placed in a perpendicular position. [*Lond. Jour.*

On Sugar from the Seckel Pear.

[The following communication from Mr. Brasier to the College of Pharmacy, was deemed of such importance as to be referred to a committee, whose able and detailed report we also have the pleasure of laying before our readers. Should experiments on a large scale prove equally satisfactory as those of Mr. Brasier, there can be but little doubt of the great value of this fruit in the manufacture of sugar. The greatest drawback to its extended propagation for this purpose is the time required for the tree to come to maturity, though, when an orchard has once reached the bearing age, the expense of procuring the sugar from the fruit will be incomparably less than that incurred either in the cultivation of the cane or of beet roots. We trust in the course of the ensuing year to present the results of further experiments on this subject, and we would suggest to such of our readers as have the opportunity, the value of comparative examinations of the juice of various other varieties of the same fruit.]

Philadelphia, October 20th, 1831.

The remarkable sweetness of the Seckel pears, which are cultivated at the country residence of my father, induced me to attempt to obtain sugar from them. In 1826, I commenced experimenting on them, with a view of separating the saccharine matter they contained: after treating the juice with lime, I concentrated it until its boiling point stood at 230° Fahrenheit, (the degree required for crys-

tallizing sugar,) and obtained a sirop of a pleasant taste, and of the colour of fine molasses.

The two succeeding years I obtained nearly the same results, but the sirop, as in the other case, would not crystallize; I have some at present, which still remains in the same state.

But in 1829, the season being favourable for fruit, I procured some very fine, the juice of which, (it was a grayish colour with a light tinge of orange, which last colour deepens in a very short time,) I heated nearly to the boiling point, neutralized and separated the feculent portion by treating it with an excess of lime, which, when precipitated, left a clear aqueous sirop of a light straw colour, of the specific gravity of nearly 1075. I then neutralized the excess of lime remaining in the sirop, concentrated and clarified it with ivory black, and reduced it until its boiling point marked 220° Fah. Having been prevented from attending to it for a few days, when I proceeded to terminate the concentration, I perceived that it had become so glutinous and ropy, I feared it would burn in the operation; I therefore put it into white glass bottles. It was clear, and of a fine yellow colour.

Eighteen months after this, some fine white crystals had formed, resembling those from sugar cane; (rock candy.)

Last summer I treated some juice in the same manner, but owing, I believe, to the unsoundness of the fruit, (the season being unfavourable,) the sirop was dark, and acquired a taste from the ivory black, which was of inferior quality. I then exposed the sirop in evaporating pans, in a hot atmosphere; it thickened, but has not yet crystallized, whilst the glutinous sirop of 1829, crystallized almost entirely, although the crystals were darker than those formed while cold.

Business calling me from the city, I submit to you the experiments, that you may continue them if you think proper, and take the liberty of calling your attention to a fruit which, though of a delightful flavour, is scarcely known beyond the vicinity of this city. I estimate its value for sugar, from the knowledge that its juice can be as easily and cheaply obtained as that of the apple, and that it contains near two pounds liquid sugar per gallon, whilst its agreeable flavour and sweetness leave little doubt of the quality and strength of the perry or vinegar that could be obtained from it.

That these feeble instructions may lead to the creation of a new branch of industry, is the sincere wish of

Your obedient servant,

AMABLE J. BRASIER.

The committee to whom was submitted the sugar and sirops prepared by Mr. Brasier, and presented by him to the College, beg leave to report:

That so far as they have been able to ascertain, the sugar obtained by Mr. Brasier from Seckel pears, possesses all the properties of the crystallized cane sugar, and in no respect does it seem to differ from it. Its taste, crystallization, solubility in water, &c. are exactly the same. Three samples have been submitted to the college; the

one very white, and in regular crystals; another, a little inferior; and the third sample, in a granular state, of a grayish colour, possessing the appearance and smell of dry Brazil sugar of an inferior quality.

Mr. Brasier left for the committee, two bottles of sirop made from the Seckel pear; one containing the sirop made in 1829, and which afforded the samples he produced; the other was the sirop he made last year. The principal object of the committee was the investigation of these two sirops, with the view of depriving them of their glutinous properties, as this was probably the only cause of the difficulty in the one case, and the impossibility in the other of obtaining crystallized sugar. Your committee having at their disposal but a small quantity of these sirops to experiment with, had little hope of success; but they have not been deterred from undertaking the task, though their experiments may have proved few and unsatisfactory. They expect to be able next year to institute a series of new experiments upon the fresh juice of the Seckel pear, and to submit to the college a more ample and satisfactory report than this. Mr. Brazier's discovery involves, undoubtedly, a very important question—whether the northern climates are not as capable of producing sugar as the tropical. We hope that your committee will receive the assistance of persons interested in the promotion of science, manufactures, and national wealth, and that scientific and enterprising men, led towards the same object, will communicate to us the result of their own labours.

The first sirop made in 1829 is perfectly transparent, of a light straw colour, and holding in suspension a considerable number of small prismatic crystals; its consistence is viscous and ropy, and its sp. gr. 1.365; heated in a sand bath it became more fluid, but still retained its ropiness; the crystals which floated in it when cold, fell down when heated; owing to its viscidity, it mixes with difficulty in cold, but dissolves readily in warm water. In contact with sulphuric acid, it acquires a deep brown colour, without emission of sulphurous acid: nitric acid decomposes it with production of nitrous vapours and formation of oxalic acid: muriatic acid did not seem to have any action upon it. Sub-acetate of lead and alcohol rendered it turbid, and precipitated a flocculent matter.

Six drachms of warm sirop were mixed with three ounces of alcohol, (distilled from grain,) of 35° of Baume's areometer; the mixture became turbid, and a white precipitate of flocculent matter subsided gradually; this precipitate was removed by filtration, and carefully washed with tepid alcohol. The alcoholic liquors were united and slowly evaporated at a heat of about 160.° When reduced to the crystallizable point the sirop had lost all its ropiness: carried to dryness it produced five drachms of very white sugar, impregnated with the smell of whiskey, and slightly contaminated with a little uncrystallizable sirop. After washing this sugar with alcohol, it was redissolved in distilled water, and the sirop, reduced to the crystallizable point, was entirely deprived of its former ropiness, and deposited, on cooling, a number of small crystals of pure sugar; what remained on the filter was found next morning to be a hard substance, much

reduced in size, and weighing four grains only. This substance, examined with the glass, presented the following characters—it was of a red brown colour, shining and hornlike on the side exposed to the contact of the air; on the other side it appeared spongy, porous, and of a lighter colour: its sp. gr. was great. Thrown into boiling water, it did not dissolve, but became white, and considerably larger; it continued, however, to sink in water. This substance had many of the characters of gluten, but submitted to the action of the fire it did not evolve an ammoniacal odour; it burnt with a black smoke, and emitted an odour similar to lignia, leaving for residuum a piece of charcoal about one-fourth its former bulk; another piece withdrawn from the boiling water, and submitted to a gentle heat, gradually resumed its former bulk, hardness, and colour. Iodine had no action upon this substance, but hydrochloric acid dissolved it completely.

The brown sirop of 1830, was treated in the following manner—two ounces were dissolved in one ounce of boiling distilled water, and then mixed with six ounces of alcohol of 35°. The mixture became turbid, and a copious precipitate fell down; this precipitate separated from the alcohol, did not adhere to the fingers, and could be malaxated like warm molasses candy. This precipitate dissolved easily in boiling water, but sweetened it very little. A portion of it permitted to dry in the air, acquired a deep brown colour, shining at the surface, and spongy inside, of a sweetish taste, somewhat like the flesh of a dry raisin. Thrown upon an ignited coal, it swelled up, took fire, and burnt with the smoke and smell of a woody substance, but without emitting either an ammoniacal or burnt sugar smell.

The same filtered solution was then treated with sub-acetate of lead, which threw down a very copious precipitate; the liquid became considerably lighter in colour, and after being filtered, a stream of hydro-sulphuric acid was passed through it to precipitate the lead; it was filtered again, after ascertaining that it was entirely free from lead. The liquor now reddened litmus paper, but the acidity was soon removed by boiling. It was then evaporated to the consistence of a thick, transparent sirop, of the colour of light Madeira wine, which was set aside to crystallize, but did not, after remaining several days.

It may be inferred from the above experiments, that the difficulty experienced by Mr. Brasier in crystallizing his sirop of Seckel pear, was owing, principally, to a peculiar mucous substance which he did not separate sufficiently by the process he followed in his operation, and which rendered his sirop viscous and ropy. The sirop made in 1830, evidently contained a much greater portion of this mucilage than the other, and was, besides, as we learn, submitted to a very protracted action of heat, which is known to deprive solutions of sugar of the property of crystallizing. We have hardly any doubt that a better process than that resorted to by Mr. Brasier may be applied to the manufacture of sugar from the Seckel pear, and we are disposed to think that the employment of the sub-acetic of lead, instead of lime, for precipitating the vegetable, mucous, and colouring

principle, will obtain the desired object. This means has already been proposed for the purification of cane and beet sugar, but as the salts of lead combine with sugar, and are separated from it with difficulty, it was abandoned. However, it is asserted in the Dictionnaire des Drogues, that some manufacturers have succeeded in this desideratum, and that this method will, before long, produce a great revolution in the art of sugar refining.

Now the question is, whether the manufacture of sugar from the Seckel pear may become an object of industry and of advantage to the country. The solution of this important question is yet beyond our reach; our data, in reference to this point, are altogether insufficient, as we have no means of establishing a comparison between the quantity of sugar that two similar portions of land might afford, if cultivated, one with sugar cane, and the other with Seckel pear trees, nor between the relative costs of cultivation and manipulation. However, if we compare the richness of the juices of sugar canes, beet roots, and Seckel pears, we shall find that the last possesses a great superiority over the others. According to Mr. Gillmer, (Dictionnaire des Drogues,) Mr. Achard, a distinguished chemist, and a manufacturer of beet sugar, obtains four, to four and a half per cent. of sugar from the juice of red beets. Edwards, in his history of the West Indies, relates that the average quantity of sugar obtained from the juice of the cane, is about ten per cent.; now Mr. Brasier tells us that one gallon, or eight pounds of Seckel pear juice, yields two pounds of liquid sugar,* that is, 24 ounces of dry sugar, or 18.75 per cent., about twice as much as the juice of the cane. Thus if the assertion of Mr. B. be correct, which we confidently believe, a Seckel pear tree, producing four bushels of pears of 60 lbs. to the bushel, would yield three-fourths their weight of juice, or 180 lbs., which would produce 34 lbs. of dry sugar; and one acre of ground, planted with 100 Seckel pear trees, each producing four bushels of fruit, will yield 3400 lbs. of dry sugar,† without preventing the soil from affording other agricultural products.

The genus Pyrus, (pear tree,) belongs to the class Icosandria, order Pentagynia of the artificial system of Linnæus, and to the family Rosaseæ of the natural order. It was divided by Linnæus in three divisions; the Pyrus proper, *P. malus* and *P. Cydonia*. Persoon has separated the latter from the genus Pyrus, and formed a new genus under the name of Cydonia. From five species of Pyrus described by Persoon, the *P. communis* is the only one bearing fruit, which, by cultivation, is susceptible of becoming eatable.

In the natural state, the pear tree acquires considerable dimensions, and its branches are frequently terminated by long, straight,

* One pound sugar, made up in sirop, gives one pint of the latter, weighing one pound five ounces avoirdupois.

† Each face of a square acre, containing 4840 square yards, is 69.6 yards long, or 208 feet. By leaving fourteen feet free from the edge of each of the faces of the square acre, to the first row of trees, and planting the trees at twenty feet distance from each other, it is found that one square acre will contain ten rows of ten trees each.

and hard, prickles; its fruit is acerb, hard, and its flesh granular. This single species has, by cultivation, produced a great number of varieties, which are propagated by grafting, and distinguished by difference in shape, size, and colour, and especially by the taste of the fruit. Tournefort arranged these different varieties into three different classes; the Summer, the Autumnal, and the Winter pears. The pear which is the subject of this report belongs to the second class. It is known by the name of Spicy, Musk, or Russet pear, and is called by the French *Rousselet de Rheims.*

The Seckel pear derives its name from a gentleman of this city, who, it seems, was the first who paid particular attention to the fruit, and to spreading the tree among his friends and the public. However, Dr. D. Hossack, in an account of the Seckel pear, which was published in the third volume of the Transactions of the Horticultural Society of London, asserts, on the authority of a respectable friend, that seventy-two years ago, this pear was grown in the neighbourhood of this city, by a person of the name of Jacob Weiss, who had obtained the tree at a settlement of Swedes which was early established in the vicinity of Philadelphia, and that most probably Mr. Weiss, and the father, or grandfather, of Mr. Seckel were intimate, as both families were Germans, and of that rank in society which might be likely to lead to such an acquaintance. The conjecture therefore is, that under such circumstances, Mr. Seckel's family obtained the grafts from Mr. Weiss's tree; however this may be, Mr. Seckel deserves the credit of having propagated this delightful fruit, and having paid the greatest attention to the cultivation and melioration of the tree.

That the Seckel pear tree is a native variety of the neighbourhood of Philadelphia is incontestable, from the circumstance that it is hardly known out of the vicinity of this city, and because it has never been described by European horticulturists, except from the descriptions of our own authors, and as having been procured from this vicinity. There are already several sub-varieties, slightly differing in size, colour, and taste.

It is thus described by Mr. Cox, in his work on the fruit trees, published in this city in 1817. "The fruit is generally small, round at the blossom end, diminishing with a gentle swell towards the stem, which is rather short and thick; the skin is sometimes yellow, with a bright cheek, and smooth; at other times it is a perfect russet without any blush; the flesh is melting, juicy, and most exquisitely and delicately flavoured. The time of ripening is from the end of August to the middle of October. The tree is singularly vigorous and beautiful, of great regularity of growth, rich in foliage, and very hardy, possessing all the characteristics of a new variety, and, as a native tree, it is but little affected by that species of blight, commonly called fire blight, which, in this country, destroys so many pear trees of the imported varieties." A good representation of this fruit, copied from a drawing executed by Mr. Cox's daughter, has been appended to the account given by Dr. Hossack, and published in the Transactions of the London Horticultural Society.

The Seckel pear may be cultivated, and will flourish, on almost any species of soil; it should always be grafted or inoculated on the wild pear tree, as grafting on the quince tree subjects it to the same diseases with which this tree is generally affected in this country. It should be four or five years old when planted in the orchard, and each tree at a distance of from eighteen to twenty-five feet. Many horticulturalists whom we have consulted, prefer the smallest distance, or twenty feet at most, as by this method the trees protect each other from the wind, frost, sunbeams, &c.

It bears fruit at from five to six years old; at that age the product is trifling, but from eight to twelve years it increases considerably; when fifteen years old they are in full bearing, increasing, however, until they are twenty-five. Their average product, from fifteen to twenty-five or thirty years old, is variously reported, and there is generally one good and one bad year. The minimum product seems to be, on an average, four bushels of fruit.

It acquires considerable size, and lives forty, fifty, and as long as sixty years. The general experience is, that it is very little subject to the diseases afflicting other trees, more easy to cultivate, and bearing generally more fruit than any other.

Your committee have thus given as succinct an account as practicable to do justice to the subject, although they have extended their report far beyond the limits they had originally prescribed; yet they would do injustice to Mr. Brasier, as well as their own feelings, if in concluding the report, they omitted to say, that they consider him entitled to great praise for the talents, perseverance, and ingenuity he has evinced in the prosecution of the experiments, the results of which they have been examining, as well as those which have enabled him to saccharify, *directly*, rye, and other kinds of grain, the sweet and common potato, and other vegetable substances containing fecula, by means of the combined action of heat and water, acidulated by sulphuric acid, and afterwards to convert the liquid sugar thus obtained into alcohol, and cannot but believe that the ultimate results of them will prove highly important to the country.

E. Durand,
Jos. Scattergood.

[*Jour. Phila. College of Pharmacy.*

To the Editor of the Repertory of Patent Inventions.

Sir,—If the communication, which I send herewith, comprising "Observations on the preservation of lives from Shipwreck," &c. so far meet your approbation, and be so far consistent with the plan of your work as to obtain a place in its valuable pages, I shall probably trouble you again with a few thoughts on other subjects, and am,

Sir,

Your obedient servant,

Bristol, September 6. E. H.

Observations on the preservation of Lives from Shipwreck, with a suggestion for the employment of Sky Rockets. By EDWARD HODGES, *Mus. D.*

THE calamitous instances of the wholesale destruction of human lives by shipwreck, which have lately occurred, more especially the recent case of the loss of the Rothsay Castle, by which more than a hundred souls were hurried into eternity, have called the attention of most reflecting minds to the subject of the possibilities and probabilities of preservation from such disastrous accidents. Many have been the plans heretofore devised to carry into effect so humane and laudable an object; yet fresh instances of marine calamity are constantly calling forth other schemes, which perhaps attract attention for a little while, are acted upon probably in one or two instances, and then are heard of no more.

Still it is to be hoped that eventually some settled principles of action may be arrived at, and made generally known as well to those who plough the mighty deep as to the inhabitants of our coasts; principles of prevention, and principles of remedy, when danger threatens or direful accident takes place. As a contribution towards this desideratum, I will endeavour to suggest a few observations, some *one* of which may possibly hereafter conduce to the preservation of the life of a fellow subject, and if *but* one, my labour will meet with an ample reward.

With regard to the total prevention of shipwreck, it is evidently beyond the reach of human wisdom or foresight. Storms, tempests, and hurricanes, doubtless will continue to agitate the ocean; and whilst man shall continue to trust himself upon its bosom, he will ever be exposed to their occasionally fatal influence. But it does not therefore follow that he ought to neglect all precautionary measures—that he shall tempt the treacherous deep in a frail vessel, the certain prey of the first boisterous gale he may encounter—that he shall omit to provide himself with the most approved nautical apparatus—that he shall disregard the friendly admonitions of beacons and light-houses, warning him of sunken rocks and hidden dangers—or that he shall despise even a landsman's well meant, although perhaps not technically expressed, hints for his farther security, from or during moments of impending destruction. Trusting then that my remarks may be received with good humour even by nautical men, I will venture to proceed.

The principal dangers to which a ship is exposed are three; fire, foundering at sea, and striking or running on shore; which last is what is most commonly understood by the term shipwreck.

With respect to the first and second of these, (as far as the second may be the result of *leakage*,) I offered some suggestions many years ago, to several mercantile gentlemen, who, however, denounced my idea as impracticable, because it would impede *stowage;* the stowage of a cargo being considered a matter of much greater importance than the safety of the passengers and crew. The plan perhaps was

not likely to be *profitable*, and certainly would prove somewhat expensive, and, consequently, could not be expected to meet with even partial adoption. It was published in one of the provincial papers, and in consequence of the loss of the *Comet*, in 1825, was then again brought forward in the Bristol Mirror, in which its peculiar adaptation to *steam-boats* was especially pointed out. *It proposed the division of the hull laterally into three distinct holds or compartments, having no communication with each other.* The partitions were to be as substantial and water tight as the sides of the vessel, so that should the water gain access to one-third, the other two would preserve their buoyancy. This arrangement, it is evident, would be advantageously applied to ships engaged in the *corn* trade, or in carrying any other merchandise for the deterioration of which by damp, &c. the underwriters are not liable. In case of *fire* one part of the ship might be scuttled, or deluged, without injuring the next; besides the increased chance of *stifling* it in its origin: and in the event of bursting a boiler on board a steam vessel, such a provision would be found of no mean utility. There can be no valid reason assigned why such a proposal should not be acted upon with reference to those steam-boats which are constructed for the purpose of conveying *passengers* rather than *goods*. The anxiety and apprehension of the public having been generally roused by the late fearful death-dealing accidents, such a *safety boat* as is here recommended, would undoubtedly be preferred; and thus, for once, the love of money may be enlisted on the side of humanity.

People are frequently exposed to greater danger on board of steamers than those of which they are at all aware. I remember, some few years back, witnessing a circumstance which placed my own life, as well as the lives of forty or fifty others, in jeopardy. This happened on board a small steamer, which was then running in opposition to another, both designedly starting at the same time. A few minutes previously to starting, the steam being well up, I observed the man who acted as engineer, *placing additional weights upon the safety valve*. Not content with such small matters as were lying near at hand, he fetched a large iron spanner, weighing several pounds, and placed that also upon it; and it was not until I had suffered the infliction of some abusive language, and threatened not only to leave the vessel myself, but to alarm the other passengers, that I succeeded in inducing the heedless fellow to remove the obnoxious additions to the customary working-weight of the engine.

Such instances of murderous indiscretion are, it is to be hoped, rare; but the public will not much longer rest satisfied without something more than a mere *hope* that the engineer is not only an experienced, but a careful and trust-worthy man. They must also be thoroughly assured that the other officers are individuals not only of skill but of sobriety; and that the vessel itself is sea worthy, and properly manned and appointed. If no legislative enactment enforce this, (which is much to be wished, for the safety of his Majesty's lieges, and which assuredly would throw no obstacle in the way of the honourable exercise of the steam trade,) the prudential considera-

tion of the public will eventually prevail; and perhaps after a few more Comets, and Frolics, and Rothsay Castles have been the means of engulfing fresh hecatombs of victims, the owners of such craft will find themselves under the necessity of certifying periodically, under competent authority, that their vessels and engines are in proper condition—that they have secured the services of skilful and prudent officers—and that they have provided all possible means of preserving lives in the event of unavoidable accident.

But after all the precautionary measures which ingenuity may suggest, or wisdom may devise, have been adopted, casualties will still occasionally occur, and the agonizing shrieks of shipwrecked men, women, and children will again be heard to mingle with the hideous roar of the midnight hurricane, and the awful under growl of the tumultuous Atlantic, as, in its "foaming fury," it beats against our iron-bound shores. This is the time for calling into activity every muscle of the body, and every energy of the soul; and accordingly we find that on such occasions individuals have ventured their lives, and performed feats of almost incredible heroism, in rescuing their fellow sufferers from a watery grave.

Life-boats, and various kinds of apparatus for projecting lines and ropes, have from time to time been invented, and happily, (when at hand,) have not unfrequently been the means, under Divine Providence, of saving many from destruction. Honour be to the inventors of such praiseworthy contrivances, amongst which I cannot but number the simple, yet highly promising method devised by Lieut. Cook, of converting a boat used for ordinary purposes into a life-boat, by means of a canvass deck, as described in the Repertory, No. 77, for August, 1831. But alas! in how many fatal instances have these appliances been wanting. How commonly do we hear of a wreck taking place at a part of the coast where no assistance was at hand—no friendly life-boat to take off the perishing sufferers—no Captain Manby's, or Mr. Murray's apparatus to effect a communication by means of a rope, even when the distance was practicable, and no sort of provision found on board for so lamentable a contingency. And in how many instances, even when at hand, do they unfortunately fail of success; in some, even augmenting the calamity by the fruitless sacrifice of lives engaged in the benevolent work. Thus frequently are all on board left to perish, saving, perhaps, one or two poor mariners, who reach the shore, scarce knowing how, wafted to some place of safety by the special favour of heaven.

The first grand desideratum in all such cases, is to get a line, or hawser, on shore. This matter once achieved, the daring activity and courageous self-possession of sailors quickly enable them to attain to terra-firma, and their ingenuity soon contrives, by the same means, to effect the deportation of those of their passengers who may not be endowed with the requisite strength and nerve to contribute in any material degree to their own rescue. Now it is obviously much more rational to provide a ship with *the means of throwing a line ashore*, should she chance to be stranded, than to trust to the uncertain possibility of an apparatus being provided on land; as she may strike on

the coast of some desolate island, or be stranded on some barbarous shore, where all such contrivances are utterly unknown.

The plans proposed for effecting this desirable purpose are by no means so numerous as might have been expected. The first thought is that of carrying out a line by means of a boat; but probably the boat is swamped in the first or second attempt, and thus this hope is cut off. *Storm-kites* have been proposed, to be constructed upon the wreck, wherewith to waft a line with the grappling-iron attached. To say the least, such a species of manufacture is not likely to be efficiently executed under such circumstances. The ingenious Mr. Pocock has, in his patent kites, improved upon the idea, and rendered the scheme more practicable, by inventing a method of folding them up, so as to be enabled to keep large kites stowed in a very small space, and capable of flight after but a few minutes preparation. Besides this, their manageableness when mounted, and the tractability with which they may be raised or lowered, and veered right or left, eminently entitle them to the notice of nautical men, for this as well as for other services.

Captain Manby's apparatus, being somewhat cumbrous, not being serviceable on other occasions, besides being liable to the objection that the sudden velocity given to the shell frequently snaps the line, although now in use for some years, makes but little way towards a general adoption on board each individual ship. On land it will no doubt continue to be most effectively employed.

Mr. Murray's *arrow*, to be discharged with a line, from a musket, as being much more portable, seems to promise more universal utility; but it is liable to the objection that having no grapnel attached, it must be nearly confined to the service of throwing a line from the shore to the ship, not from the ship to the shore, unless indeed, in the latter case, friendly parties were at hand to assist by making it fast, or by hauling upon it, which evidently cannot be expected to be always the case even on our own island.

I know not whether the employment of the *sky rocket* on such occasions has ever been suggested or not, but it seems to me to be one of the most likely means of effecting a communication. A powerful rocket will carry with precision, to a great distance, a very considerable weight, and probably might be made to convey not only a small line, with a grappling iron attached, *but even a double line reeved through a block*, so as to enable the unfortunate parties on board to haul a stronger rope on shore without farther help. It will be necessary to attach a few yards of light chain to the rocket, so as to keep the line clear of the shower of fire to which it would otherwise be exposed; and then, I doubt not but that the rocket will prove as effective an instrument in the preservation of lives, as in other hands it has been rendered conducive to their destruction. The rocket would at the same time operate as a signal of distress.

If this suggestion be considered worth a trial, I leave it for those who may be more interested in the result than I am, and who are possessed of better means and opportunity to try the experiment. I only add, that I presume the chain must be attached about the centre

of the stick, or between that point and the rocket; but this, actual experiment alone can determine.

Having thus started one idea, I pass on to make a few remarks upon the other means of saving endangered lives, by the employment of rafts, or floats, and by attaching to the person buoyant substances of divers kinds.

Sailors have long been justly celebrated for the expertness and despatch with which, under such untoward circumstances, as those that ordinarily attend the occurrence of shipwreck, they contrive and construct a raft; but they do not appear in such cases to have uniformly turned their empty water casks to the best possible account. True that a single empty cask, notwithstanding its buoyancy, forms a very untrustworthy support for a drowning man; it constantly eludes his grasp, and perhaps even hastens his destruction. But *two* casks lashed together would form an effective support to two or three individuals, who might thus be wafted on shore. A *series of casks* thus strung together would be still more serviceable, and although some few, perhaps many, of the parties trusting to them might be seriously injured, or even killed, by the violent collisions which might be expected occasionally to take place between them, yet the probability is, that the greater number could be saved.

The *cotton jackets* to be inflated with common air, which have lately been invented, seem to promise much, and I trust, will soon be brought into general use. But the material is so frail that it would certainly be preferable to make the jackets of the patent *air-tight cloth*, of which the inflated beds and cushions are constructed. This substance would be less likely to be rendered unserviceable by an accidental scratch or collision with any sharp or pointed body. Where would be the harm of requiring that every steam-boat should carry a number of these life-jackets, equal to the average number of passengers? Prudence, however, would dictate the propriety of each individual furnishing *himself* with a garment of this description, which might be made either in the shape of a waistcoat, or in that of a shooting jacket, and would be by no means an unsightly article of attire. It would be well if these life-preservers were made to consist of two, three, or more, separate air-cells, having no internal communication, and of course, therefore, to be separately inflated; when, in the event of damage or leak in one part, the remaining parts would still be sufficiently buoyant to float the body.

With respect to the management as applied to the case of ladies, there would seem to be more difficulty; but I doubt not but that, if their modesty be so great that they would not put on a man's jacket even to save their lives, their ready ingenuity will quickly contrive the way to manufacture a female life-preserver in the shape of some useful or elegant piece of dress. *e. g.* a cloak, or a spencer, or a pair of handsome *balloon sleeves*, and so the foolish vagaries of fickle fashion herself shall be rendered instrumental in the preservation of life. Let the ladies see to it.

But these things will be in some degree expensive, and beyond the means of the poor, who constitute by far the majority of steam

travellers. What are they to do? Why, I recommend them to furnish themselves with a few *hogs bladders*, or the bladders of any other animal from a sheep upwards. Any man might with ease carry a dozen or more in his pocket, and if fastened in pairs with strong twine, he would upon emergency find them quickly available. With a pair attached to each arm, a man might float upon the waves for hours.

Had there been a basket or chest full of bladders on board of the Rothsay Castle, or the Frolic, how many valuable lives might have been saved! Had the steward of the former providently stocked himself with a good store of such commodities, instead of lashing himself and his hapless wife to the mast, and there in bitter and unavailing agony terminating his earthly career, the rational probability is, not only that both of them, and many of those who were involved in that terrific catastrophe, would have been saved, but that he in particular would have been *enriched by the adventure*, for assuredly he would have found no difficulty in disposing of his bladders *at any price*. Let all steam packet stewards then take the hint. Such a calamity may again occur, and in their own experience too; and in such an event they will find two or three guineas worth of hog's bladders a much more profitable speculation than a dozen hampers of porter, or ten thousand bottles of soda water. [*Rep. Pat. Inv.*

Power of Draught at different velocities, and on various kinds of Road.

TO THE EDITOR OF THE REPERTORY.

Sir,—Finding, upon conversation with a coach proprietor, that some very erroneous notions respecting the force required to draw a carriage under different circumstances, prevail amongst those persons who are immediately interested in being well informed on the subject, I am disposed to believe that the public generally, (with the exception of the scientific few,) are inoculated with the same errors, well knowing that it is usual to put implicit faith in what "practical men," (as they are called *par excellence*,) promulgate in their own particular avocation. It is almost universally said and admitted, that it requires less power to work a coach at a high than at a low velocity; and as this doctrine may lead some of your ingenious readers into very erroneous calculations, I am anxious to see introduced into your useful work, some account of the extensive series of experiments made by Mr. Macneil, (under the superintendence of Mr. Telford,) on the London and Liverpool road, in which the force of traction was very accurately ascertained by means of an improved dynamometer, invented by Mr. Macneil.

The general results of experiments made with a stage coach from London to Shrewsbury, a distance of 153¼ miles, on different inclinations, and at different velocities, are given in the annexed table:—

Rates of inclination.	Rates of travelling.	Force required.
1 in 20	6 miles per hour.	261
1 in 26	6	213
1 in 30	6	165
1 in 40	6	160
1 in 600	6	111
1 in 20	8	296
1 in 26	8	219
1 in 30	8	196
1 in 40	8	166
1 in 600	8	120
1 in 20	10	318
1 in 26	10	225
1 in 30	10	200
1 in 40	10	172
1 in 600	10	128

From the foregoing statement, it is evident that the power of draught required, constantly increases with the rate of velocity of the carriage, though apparently not always in a uniform ratio; owing most likely to the varying resistance even of the same piece of road in a different state of the weather.

Another piece of information furnished by Mr. Macneil's experiments, and inserted in Mr. Telford's report, I annex, as it appears to be of great practical value.

On a well made pavement, he found the force of the draught to be	33 lbs.
On a broken stone surface, on old flint road	65 lbs.
On a gravel road	147 lbs.
On a broken stone road upon a rough pavement foundation	46 lbs.
On a broken stone surface upon a bottoming of concrete, formed of Parker's cement and gravel,	46 lbs.

Hoping, Mr. Editor, that you will deem this subject worthy of the consideration of your readers,

I remain,
Your constant reader,
JAMES GREEN.

Wine Office-court, Fleet street, Oct. 3, 1831.

Remarks on the foregoing.

We entirely coincide with our correspondent in his estimation of the data he has obligingly furnished us from Mr. Telford's Report, though we do not take quite the same view of the opinion quoted of the coach proprietor, who appears to us either to have mistaken the true fact of the case, or to have misstated it. If he had said that "it requires a less *quantity* of power to work a coach *a given distance*, (or journey,) at a high velocity than at a low velocity, we think he

would have been right, and that such will appear from the data, which Mr. Green has supplied us: we will, however, take leave, to place Mr. Macneil's table in a more convenient form for comparison and examination.

Rate of inclination.	Force required at 6 miles per hour.	8 miles per hour.	10 miles per hour.
1 in 20	268	296	318
1 in 26	213	219	225
1 in 30	165	196	200
1 in 40	160	166	172
1 in 600	111	120	128
	917	997	1043

The second and fourth lines of figures, (1 in 26 and 1 in 40,) present some discrepancies, which we do not know how to account for. In each of these cases, we observe the increase of force required at the several velocities, is just six pounds, while the increase in the first and third is far greater, and they all vary considerably. The safest way, therefore, to calculate from such data, is to take the total forces at each velocity, which is shown above in 917, 997, and 1043. From these we may conclude, that a given load, which requires to draw it a force of

9¼ lbs. at 6 miles per hour, will require
10 lbs. at 8 miles ———, and
10½ lbs. at 10 miles ———.

Or, we may say, that it requires about *an eighth* part more of power to increase the velocity from six to ten miles per hour; in return for which we have an increased velocity of motion of *four-tenths*, which is a saving of nearly *three-ninths*, (or one third,) in the quantity of power expended in conveying a given load the same distance.

Let us suppose a journey from London to York and back, which we will call 600 miles, (it is nearly,) for the convenience of calculation.

At 6 miles per hour it will take 100 hours.
At 10 miles - - 60 hours.
Therefore, 917 lbs. (total of 6 mile forces,) × 100 is 91,700
And 1043 lbs. (total of 10 mile forces,) × 60 is 62,580

Making a difference of force in favour of high velocity of 28,420 lbs.

Or nearly one-third, (three-ninths of 91,700,) as before mentioned; although it takes a *greater power during the same space of time* to draw at a high than at a low velocity: the gain being in the increase of space passed over by a given power in a given time. No advantage can, however, be taken of this circumstance, with carriages drawn by horses; as horses can exert but very little power of draught at high velocities, which makes it necessary to put four horses to run a coach load, that would require only one horse at a walking pace: and the

walking horse, though drawing four times the load of each of the runners, and working three times longer, would be less fatigued at the end of the same journey. But in locomotive carriages the case is otherwise, as in them all the great advantages which result from a high velocity may be made available; and it will be mainly owing to this circumstance that locomotive carriages will ultimately supersede the use of draught horses on the common road. We are inclined to believe that in less than three years hence, this will take place in fast-going carriages for passengers and burthen, and that a more gradual amelioration and change to the same system, will take place in the slower going vehicles.

The reader to whom this subject is novel, should be mindful not to mistake the data we have used in our *comparative* estimate, for the real power required to draw a coach load; that being only about a sixth part. Mr. Macneil's statement, given by our correspondent, relates only to *ascending* inclinations; and as 111 lbs. is given as the force of draught in an inclination of one in 600, at six miles per hour, we may assume from all the data given with respect to the effect upon different kinds of road, that 100 lbs. will be about the average force of draught upon a level, and as the momentum acquired in descents will compensate for the loss of it in making ascents, 100 lbs. is probably very near the truth. Taking that for our datum, the following table will show the comparative quantities of power and draught expended in travelling 600 miles at the several velocities of motion:—

Ratio of velocity.		Time of journey.		Distance.	Force of draught.	Comparative quantity of power expended.
6 miles per hour	×	100 hours	=	600 miles	100 lbs.	100,00
7 miles - -	×	85+ - -	=	600 - -	104 lbs.	88,40
8 miles - -	×	75 - -	=	600 - -	107 lbs.	80,25
9 miles - -	×	66 - -	=	600 - -	110 lbs.	72,60
10 miles - -	×	60 - -	=	600 - -	113 lbs.	67,80

[*Reg. of Arts.*

Theoretical and Experimental Researches to ascertain the Strength and best Forms of Iron Beams, by Eaton Hodgkinson.*

From the Memoirs of the Literary and Philosophical Society of Manchester, 1831.

"1. The very frequent use of iron beams for supporting the floors of factories, and of other places crowded with people, renders it ex-

* We are indebted for the use of the work forming the subject of the following article, to our esteemed friend William Strickland, Esq., Architect. We purpose to make such extracts from it as will put our readers in possession of the valuable information which it contains; giving as much attention to the theoretical part of the work as will be necessary to present a correct view of its bearing upon the experimental researches.—Com. Pub.

tremely desirable that the best information should be obtained with respect to the strength of this material, in order to insure, without a great superfluity of metal, the requisite stability. In a case so deeply involving the loss of life, and where a failure would be attended with such serious consequences, hardly too much research can be applied. The scientific character of the subject also imparts to it additional interest; and we cannot, therefore, be surprised, that the strength of materials has engaged the attention of many of the most distinguished philosophers from the time of Galileo, who was the parent of these inquiries, to the present age; including the names of Bernoulli, Euler, Lagrange, Coulomb, and Robison.

"These great men have shown in its different departments, how the refinements of speculative science can be applied to practical purposes. They have done much—but owing perhaps to a disinclination to the labour and expense of making sufficient experiments, much was left undone for later inquirers. And in the lateral strength of bodies, after all the hypotheses that have been employed upon it, the practical man has been till lately without a general and satisfactory theory.

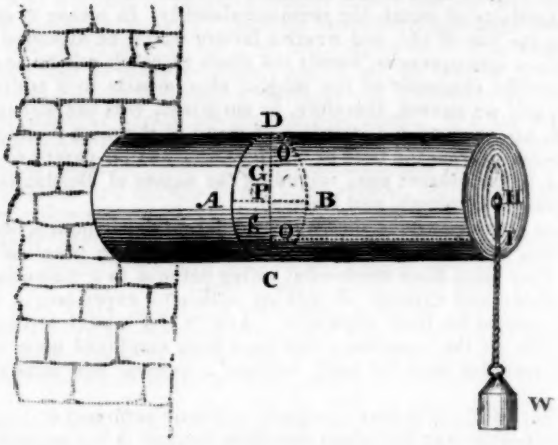
"2. But, while it is thus necessary to insure sufficient strength, it is very desirable that the beams should be formed in the manner best adapted to resist the strains to which they are subjected: and if, by an alteration from the usual shape, the same strength could be obtained with a smaller quantity of metal, the expense would be reduced; and the material rendered even capable of bearing more pressure, by having less to support in its own weight. It may be stated in illustration of this remark, that there are usually upwards of 100 tons of metal in the beams supporting the floors of a factory.

"3. To attain these objects, as far as lay in the power of the author of this paper, a number of experiments have been made; but before giving an account of them, it may be proper to describe the nature of the strain to which bodies thus acted upon are exposed."

"4. Suppose a beam, placed horizontally, with one end firmly fixed in a wall, and a weight hung at the other, it will bend: but, it is evident, this could not take place, except by the lengthening of the top parts, or the compression of the bottom, or by both. Now, both of these effects do actually take place; and hence, there is some intermediate point, or line, between the top and bottom of the beam, where the particles are neither extended nor compressed: all above being in some state of tension, and all below compressed. This line may properly be called the neutral line.

"If then, ADBC represent a transverse surface of the beam, and AB the neutral line, ADB must be the surface of tension and ACB that of compression.

Fig. 1.



"Now, it is evident, that the extensions or compressions of any particles within these surfaces, will be as their distances from the line AB; and the forces, exerted by those particles, must be in the same proportion, so long as the elasticity remains perfect; for then the forces are found to be as the extensions or compressions."

Afterwards the forces of the particles would vary in some different ratio of the distance.

The fact that the forces of the particles on each side of the neutral line are equal, furnishes a method of determining the position of that line.

The force of each particle in the surface of tension is represented by the product of that particle into its distance from the neutral line AB. The sum of the forces of the particles in the surface ADB, of tension, will give the force of tension produced by the weight W. By a well known property of the centre of gravity, viz. that it is the centre of mean distance, the sum of the particles in the surface ADB multiplied by their respective distances, may be represented by the surface ADB, multiplied by the distance of its centre of gravity, G, from the axis AB; that is, by the surface ADB multiplied by GP, (ADB × GP.)

In like manner, the force of compression, produced by the weight W, in the surface ACB, may be represented by the surface ACB multiplied by gP, (ACB × gP,) g being the centre of gravity of the surface of compression ACB.

If the resistance of the solid to extension be equal to its resistance to compression, then the two products found above will be equal. This, it appears by experiment, is nearly the case in cast and in wrought iron, but is not so, (according to some experiments made by our author,) in timber.

In general, then, the products found above to represent the forces of tension and compression, cannot be taken as equal, but we have always the proportion, as

*ADB × GP : ACB × *g*P : : force of extension : force of compression.

We see from this that the neutral line divides the surface of fracture, so that the parts multiplied by the distances of their centres of gravity from the neutral line, are in a constant ratio.

In the cases of cast and malleable iron, as stated above, the ratio is that of equality, or

$$\text{ADB} \times \text{GP} = \text{ACB} \times g\text{P}.$$

If we suppose these products equal in a homogeneous beam of a circular, or rectangular, section, the surfaces ADB and ACB must be equal, that is, the neutral line bisects the section.

Thus much for the means of determining the position of the neutral axis.

If we would consider the total effect produced by the weight W, we should observe that it tends to turn the particles in ADB by tension, about the neutral line AB, and also those in ACB by compression, about the same neutral line. If we suppose the resultant of all the forces of tension to pass through O, the effect of tension around the axis AB will be represented by the sum of the tensions of the particles in ADB multiplied by the distance OP. If, in like manner, we take *o* for the point through which the resultant of compression passes, the effort to turn about AB by compression will be measured by the sum of the compressions of the particles multiplied by *o*P. But the weight W acts with the leverage of the length of the beam to the surface of fracture, that is, with *o*I; whence its effect is measured by W, multiplied by *o*I. This last effort being equal to the sum of the two former, we have

W × *o*I = OP × sum of tensions of particles + sum of compressions × *o*P.

We have before seen that the sum of the forces of tension and of compression on each side of the neutral line, are equal, whence one may be substituted for the other, and our equation becomes,

$$\text{W} \times o\text{I} = \text{sum of tensions} \times (\text{OP} + o\text{P}) \text{ or}$$

† W × *o*I = sum of tensions × O*o*

Whence we see that other things being the same, the weight at H, to produce a given deflection, will depend upon the distance O*o*.

In the conditions employed to determine the points O and *o*, we recognise those for the centre of percussion of a body; accordingly O and *o* may be found by the rules given for that centre, when the position of the neutral axis has been found.

* Calling the surface ADB = *s*, GP = *g*, ACB = *s'*, *g*P = *g'*, the ratio of the force necessary to produce extension to that required to produce an equal compression, as 1 : *n*; the equation of our author corresponding to the above proportion is $gs = n\,g's'$. This is obtained by a method which we consider less simple than that given above.

In the case of timber, according to Mr. Hodgkinson's experiments, $n = \frac{4}{5}$.

† To find an absolute value for W, call PD = *a*; the weight sustained by the tension of any number of fibres at the top of the beam = *t*. Then since *t* is the force of tension at the distance *a* from the neutral line, $\frac{t}{a} \times x$ will be the force at

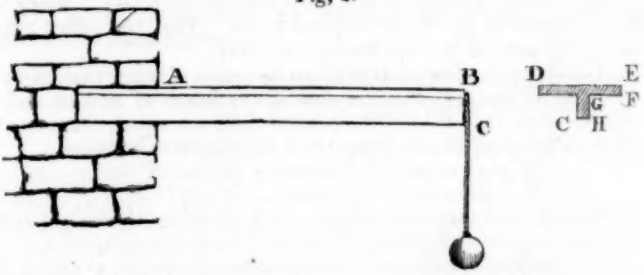
We at once perceive the influence of the form of a beam upon its strength, and that in finding the form of greatest strength we must be guided by the results just obtained. Thus, since the weight to produce a given deflection depends upon the distance Oo, we must seek to remove as far from each other as possible the points O and o, the centres of tension and compression. These points corresponding to the centres of percussion of the two parts into which the section of fracture is divided by the neutral line.

We shall have occasion to refer to these remarks in the sequel. The theory applies so long as the elasticity of the material of which the strength is to be determined, remains unimpaired.

We pass over the very ingenious experimental demonstration of the equality of forces on each side of the neutral line, made by the substitution of springs for the natural elasticity of the particles of solids, and proceed to the author's examination of the relation between the resistance of cast iron to extension and to compression.

"For this purpose, I had several castings moulded of different sizes, but of one general form, such that by bending them, first one way, and then the other, the relative resistances to extension and compression in one and the same part might be obtained. Each casting was several feet long, and equal in section throughout, with its parts as slender as could well be run to preserve it even and sound. During the experiment one end of the casting was fixed in a wall, and weights to bend it hung at the other.

Fig. 2.



any distance x, and that at the mean distance (GP$=g$) will be $\frac{t}{a} \times g$: hence the force of tension of all the particles in ADB ($=s$) will be expressed by $\frac{t}{a} \times g \times s$. Substituting this value in the equation just found, and calling l the length of the beam, we have $wl = \frac{tgs}{a}(p + p'.)$

To comprehend the case in which the beam is bent, the bearing length being altered by deflection l, becomes $l \times$ Cosine of deflection. The formula, calling D the angle of deflection, is $wl \times$ Cos. D $= \frac{tgs}{a}(p + p'.)$

Both of these equations are from the text, the method only differing from that of the author.

"ABC represents an elevation of the castings, and DCHE a cross section of all of them. The end A was wedged fast into the wall, but so as to be easily removed, in order that the casting might be turned the other side upward; as the intention was alternately to compress and extend the vertical rib of DCHE at C."

Following this method four series of experiments were made, each one consisting of a set with the vertical rib alternately downward and upward. The dimensions of the beams in series one, two, and four, were different; in series two and three nearly the same, having been cast from the same model.

The dimensions of the bar used in the series four are given, to enable the reader to judge of the scale upon which these experiments were made, and because the same dimensions were used in an experiment of a different kind subsequently made.

"Expert. 4.—Length of arm five feet—deflections taken at the end—weights hung at four feet six inches from shoulder—weight of casting at the end with scale $10\frac{1}{2} + 4\frac{1}{2} = 15$ lbs., DE = 4.1 inches, EF = .25, GH = 1.1, CH = .25."

"18. The experiments were mostly begun with the broad part of the casting upwards, to compress the vertical rib; and when a weight or two had been laid on, and the deflections noted, the piece was turned the other way up, before the elasticity was much injured, and the deflections from the same weights again taken, the rib being now extended. This mode of turning the piece, which was usually done two or three times with the same casting, it being first reduced, if necessary to its original form, answered better for obtaining the comparative extensions and compressions by equal weights, than making all the experiments on each side in a series would have done; though it left the tabular results rather more anomalous. I preferred, too, obtaining the extensions and compressions from the same rib, to taking each from different ones, on account of the difficulty of getting such small castings precisely of equal size and equal strength of iron. This mode of making the experiment, however, rendered the time when the elasticity became impaired rather doubtful."

The results are collected in the following table given by the author:—

Expts.	Weights in lbs.	Deflections from extension.	Deflections from compression.	
1st.	7	.37	.34	Earlier weights.
2nd.	30	.61½	.53	
3d.	30	.96	.97½	
4th.	30	.86	.84	
1st.	27	1.56	1.35	Later weights.
2nd.	80	1.65	1.63	
3d.	50	1.72	1.67	
4th.	60	2.03	1.86	

"19. With regard to the inferences to be drawn from these experiments, we will make the three following suppositions:—

"1st. Suppose the material to be incompressible, as has generally been assumed in this country, and the experiment to be begun with the back of the casting upwards, the leg GC will, by supposition, offer an insuperable resistance to a force tending to compress it, and the deflection must arise from the small quantity which the broad part DEF will extend: if the casting be then turned the other side upwards, the part DEF being incompressible, the deflection must arise from the extension of GC, and consequently would be many times as great as when the casting was the other side upwards, GC being so much less than DEF.

"2nd. Suppose the body to be inextensible, then if the back of the casting be upwards, the deflection will wholly arise from the compression of GC, and will be many times greater than if GC had been upwards, when it must have arisen from the compression of DEF.

"3d. Suppose the extensions to be equal to the compressions from the same forces; the deflection in this case will be the same from the same force whether the rib GC be downwards or upwards."

"The table of results shows that the first and second suppositions are inadmissible; with regard to the third, it appears that in every instance, except one, the deflections from extension are greater than those from compression by equal forces, whether the elasticity be perfect or not; the first four having been taken before the elasticity could have been much injured, and the last four nearly at the breaking point. Still the difference is not so great, but that they may, in most cases, without material error, be assumed as the same. Hence, the extensions and compressions from equal forces in cast iron, are nearly equal.

"21. This is a very interesting fact: it has often been assumed by writers, but I have not before seen any proof of it, except in an experiment of M. Duleau, which renders it very probable that it is the case in malleable iron. Mr. Tredgold, in his "Essay on the Strength of Cast Iron," has assumed it, and made it the basis of his reasonings. He thence concludes, (Section 4th,) that in a beam of the strongest form, its section ought to have equal ribs at top and bottom of it: so that the neutral axis being at half the height of the beam, there might be equal resisting powers on both sides of that axis. Another conclusion which might be drawn in the same way, and which he mentions, (page 132,) is, that a triangular prism, [he might from his view have said any other form,] is equally strong, whether it be loaded one way up or the opposite, supposing it not strained, so as to injure its elasticity."

[TO BE CONTINUED.]

Improvement in Piano Fortes.

MONSIEUR PAPE has just succeeded in improving the mechanism of the piano forte in a way that merits attention.

It has for some years been acknowledged by skilful practitioners, that if the wires of this instrument could be struck by the hammers from above, instead of from below, that a finer quality of tone, more power, more solidity, and a longer duration as to correctness of intonation would be accomplished. By dint of perseverance and a variety of experiments, Monsieur Pape has triumphed over all his difficulties; and this new piece of mechanism, carried to the highest degree of perfection, is one of the most remarkable improvements in piano fortes that have been invented since the origin of that instrument.

Monsieur Pape, in applying his discovery to horizontal grand pianos, has found the means of considerably diminishing their length, and at the same time of augmenting the volume of tone. The tone of these new horizontal pianos having made it desirable that the same mechanism should be adapted to those of the square form, he made fresh experiments, and the success of them surpassed his expectations; for in reducing his scale to less dimensions than those now in use, not only has he obtained an easier, more nervous, and more delicate touch, but a volume and quality of tone as powerful as in instruments of the ordinary length.*—*Archives des découvertes.*

*** The principle of making the hammer strike the wires from above is by no means a new invention: unless we are greatly mistaken it has been used in Germany many years. That "a finer quality of tone, more *power*, and more solidity" may be obtained by this new application, we can readily conceive; how the principle, however, should affect the "*duration* as well as the correctness of the intonation," we can by no means understand, being ignorant of Monsieur Pape's mechanism.

That with "diminishing the length, he should augment the volume of tone," too, is a very remarkable fact, and which we can scarcely credit without the aid of those two important faculties, the senses of hearing and seeing. As an improvement, however, in an elegant art, it is very valuable in every point of view; for we consider this most common of all musical instruments capable of considerable amelioration as to touch, tone, (quality as well as quantity,) and serviceable duration; for of all organs it is the earliest and the most sensibly affected by use and age. *Editor Repertory.*

Improvement in Rail-ways and Carriages at Coal Works.

In this valuable improvement the rail-way is sustained in a level and horizontal position, and at the required height, by a suitable number of upright posts, and permanently secured by bolts or other fixtures. The posts are securely imbedded in the ground, and are preserved in their respective positions by suitable bracings or stancheons. On the horizontal bars which constitute the bed pieces of the rail-way, are beds of wrought or cast iron, or other proper ma-

* See Loud's patent for this improvement in the Franklin Journal, for July, 1827.

terial, which are firmly secured to them, and extend their whole length. These beds are smooth and level to receive the wheels of the carriage, which may be flanched or grooved to move upon them. The rail-carriage consists of a frame, constructed of suitable material, to which axles of wrought iron are attached by means of bolts, or other contrivances. The wheels may be formed of wrought or cast iron, or other proper substance, and may be made solid or otherwise, with their surfaces flanched or grooved to move on corresponding surfaces of the beds of the rail-way. Attached to the bottom of the carriage, and suspended from it, is a chain, which may be lengthened or shortened at pleasure, having a hook at its extremity for attaching a coal tub. At one extremity of the rail-way is a crane, secured by suitable fixtures. This crane is supplied with a chain or rope fall, which raises the coal from the vessel to the carriages, and which may be worked by horse or other power. Beneath the rail-way, and under this crane, is a staying made to slide between the foot, and may be raised or depressed by means of pins or bolts which fit into apertures bored in the posts. The coal is raised to the staying before mentioned in tubs by a chain fall attached to the crane, where it is disengaged by an assistant, and transferred to the carriage. The carriage is put in motion by means of ropes, pulleys, or other machinery, and the coal, suspended in tubs beneath, is transported to the distance required, where it is deposited, the carriage immediately returning with the empty tub. This improved rail-way is of a double form, so as to admit of two carriages moving parallel to each other, when the middle horizontal bed piece has on its surface beds for the inner wheels of both carriages. In this case the crane is placed in the centre, and is enabled to serve each carriage in succession by swinging two ways.—*New Monthly Mag.*

Strength Test for Bleaching Powder.

The necessity of having a means of ascertaining the chlorine strength of bleaching powder has been felt so strongly, that many persons have turned their attention to the discovery of an unexceptionable process for the purpose; and the use of sulphate of indigo, of salts of manganese, and of the chlorometer apparatus of Gay Lussac, is consequently well known to all who are concerned in the use of that chemical production. M. Marozeau, amongst others, has sought to obviate the objections belonging to all the processes known, and has described, as the result of his exertions, a new process founded on the use of mercurial salts. Let muriatic acid be added to a solution of protonitrate of mercury, in quantity more than sufficient to precipitate all the mercury as calomel; then let a solution of chloride of lime be added: the chlorine set at liberty by the excess of acid will react on the calomel, will convert it into corrosive sublimate, which, dissolving, the solution will become perfectly clear and transparent again, if enough chloride of lime has been added.

This effect, when produced by known solutions of mercury and

bleaching powder, and with the attention required to obtain a complete chemical action, is said by M. Marozeau to furnish a very excellent method of ascertaining the strength of bleaching powder; for by agitation of the liquids, all the calomel at first formed may be converted into corrosive sublimate, and dissolved before the slightest odour of chlorine is sensible in the residual liquor. He uses the chlorometer of Gay Lussac, but inverts the office of the pipette or fixed measure of bulk: instead of using it to measure out the bulk of solution of chlorine to be tried, it is employed to measure out a fixed quantity of the test solution of nitrate of mercury, and the graduated jar is used to ascertain the quantity of solution of chloride required to convert the calomel when formed into corrosive sublimate.

The strengths of the solutions of nitrate of mercury and bleaching powder to be tried, are made to conform to the dimensions of the instruments constituting Gay Lussac's chlorometer. The proof liquor is procured by boiling mercury in excess in dilute nitric acid, continuing the ebullition until no deutonitrate remains in solution. The strength is adjusted in two ways, either by preparing a solution of chloride of lime with a known quantity of chlorine, and then trying it against the test solution as yet unadjusted, and diluting the latter until it agrees with this known solution,—or by ascertaining how much of the test liquor is required to precipitate the whole of the chlorine in a known solution of common salt. For, as the quantity of chlorine in common salt required to convert the mercury in a given quantity of test solution into calomel, is exactly equal to that required afterwards from chloride of lime to convert the calomel, so formed, into corrosive sublimate, it is easy to make a known solution of salt, and to dilute the test liquor, until a given quantity of it will exactly precipitate a measure of that saline solution; and such test liquor will, by the process recommended, show what quantity of the solution of bleaching powder contains the same proportion of chlorine as the standard solution of salt thus referred to.

M. Marozeau then gives minute instructions for the use of this process, intended for those who, not possessing much chemical knowledge, still have to apply the instrument; and he states that, having used it very constantly, it has afforded him highly satisfactory results.* [*Jour. Royal Institution.*

Round Sterns to Ships of War.

The important question of round sterns has with much generality been discussed; and it is therefore with no ordinary pleasure that we find a splendid prize has been offered by the French Minister of Marine, for determining among all the forms that can be presented that particular one which shall unite in the highest degree all the requisite conditions that the seaman, the naval architect, and the geometrician may require.

Our readers are aware that a vigorous contest was for a long time

* Ann. de Chim., xlvi. 400.

kept up respecting the *principle* of the round sterns; but time, which softens differences, and moulds even prejudice itself into the form of truth, has, in this case, obtained another victory; and a figure which our gallant seamen had connected with the glorious recollections of Trafalgar and the Nile, is now—with wisdom which cannot be too highly praised—nearly, if not altogether, abandoned. The square stern, with all its massy and cumbrous forms, has indeed given way to another more in unison with the great march of improvement now going on.

But while the principle of what is commonly called the round stern has, with few exceptions, been admitted in all its fulness, its best possible form has not been determined; and it would seem as if fancy, rather than the sound discretion which geometry imparts, had presided over the designs hitherto submitted to the world.

Among the infinite variety of forms which may be denominated "round," there must be one which shall unite in a higher degree than any other, all the best conditions of strength, convenience, and defence;—which shall secure to the brave sailor the greatest degree of comfort, add a new arm to his power in the day of battle, and secure to that portion of the frame work of the vessel, the same admirable strength as distinguishes its other parts. It is this choice of forms, which the French Minister of Marine now invites the naval architect, the sailor, and the man of science, to contemplate; and we hail the call as a revival of the days when the great men of the Academy of Sciences, clad in the armour of the transcendental geometry, descended from the lofty elevation of the system of the world, to contend for the conditions of the metacentre, the great principles of stowage, the problems of masting, of pitching, and of rolling, and all the other complicated but interesting inquiries, which the general question of ship-building involves.

Our *Journal*, read alike by geometricians, the naval architect, and the sailor, can hardly be better employed than in recording the conditions which the French minister has proposed for this great problem.

"To furnish the best plans for the circular sterns for line of battle ships and frigates, with all the exterior and interior fittings, the manner of disposing the timbering so as to combine the necessary conditions for defence, with strength, lightness, a dispersion of the weight in proper proportion to the displacement of each part, the efficiency of the rudder, the convenience of the water-closets, and the general suitableness of the accommodations.

"This manner of fitting the stern must possess facilities for enabling the commandant to be aware of whatever manœuvres may be in progress, without being obliged to appear on deck.

"The style of ornament which it would be proper to adopt, as well for the forward as for the after part of these new constructions, is also to be described. The competitors are to remember that nothing of importance is to be at all sacrificed to these decorations.

"The side of the ship at the stern must have the same thickness as at the corresponding places in other parts of the ship. The ports must be so disposed, that it may be easy, on each deck, to bring guns

to bear right aft, and on the angles of the quarters, to command those points which the other guns cannot be brought to bear upon.

"The rudder may be fitted either without board or within with a circular head, but reasons must be given for whatever plan may be proposed. Reasons also are to be stated for the station which may be proposed for the water closets, whether they are fitted interiorly, or in an exterior gallery.

"The officers of the different branches of the naval service are called upon to send their proposals to the minister before the 1st of July, 1832. Other persons wishing to become competitors, are eligible to do so.

"The memoir in which each competitor explains his proposals, must be accompanied with all the calculations and drawings which may be necessary to render his plan perfectly complete and intelligible in all its details.

"Each proposal must have a motto affixed to it, of which a copy is to be enclosed in a sealed letter, containing also the name and place of residence of the proposer.

"A medal of the value of 2000 francs will be given to the author of the best memoir presented to the minister of marine before the stated period. [*Brewster's Jour.*

On Artesian, or overflowing, Wells, and the employment of the Warm Water brought from great depths for economical purposes.

From the Edinburgh New Philosophical Journal.

WHENCE do artesian wells derive their water, and how do they acquire their power of ascension, which sometimes occasions in the middle of plains, at a distance from hills and mountains, the surprising phenomenon of spouting springs? are questions which have been often proposed, and very variously answered. The most natural explanation is undoubtedly that which supposes the water of these wells, like that of natural wells, to be derived from the atmosphere, and their power of ascension the hydrostatic pressure of a more elevated reservoir, with which the perforated canal or bore stands in connexion. Sometimes, however, the local relations are such that it is difficult to refer the water to such a source, and then it is that the framers of wild hypotheses stand forth with their absurdities. A late observation, which affords a striking proof of the accuracy of the above explanation, is therefore the more worthy of being noticed.

At Tours, on the Loire, an artesian well, with a bore of three and three-quarter inches, which brought the water from a depth of 335 feet to the surface, was damaged, and they were obliged, (on the 30th of January of this present year,) to remove the tube till within twelve feet of the surface. The water suddenly rushed out, increased fully to a third more than its former quantity, and continued to flow for several hours. It was now no longer clear as before; on the contrary, it brought along with it a great quantity of fine sand, and

surprising enough, also numerous remains of plants and bivalve shells; branches of the thorn several inches long, and blackened, owing to their residence in the water; further, fresh stems and roots of marsh plants, seeds of many different plants, and also fresh water shells, as *Planorbis marginatus*, also *Helix rotundata*, and *Helix striata*. All these resembled those which are found after floods, on the sides of smaller rivers and brooks. The fact is so remarkable, that the truth of it might be called in question, had it not been accurately determined. There result from it the following conclusions:

1. The water of the artesian well of the city of Tours must occupy not more than four months in flowing through its subterranean canals, because the ripe seeds of harvest have reached the mouth of the well without being decomposed.

2. As the water carries along with it shells and pieces of wood, it cannot reach its place by filtration through the layers of sand, but must have flowed through more or less irregular canals.

3. The source of this water is to be looked for in some moist valleys of Auvergne and the Vivarais.

The remains of the plants and animals are deposited in the mineral cabinet of the city. As soon as the seeds, five or six in number, are referred to their plants, naturalists will, in places situated higher than the basin of the Loire, be able to make out the points where these subterranean waters are poured out.

It is to be wished that French observers would state how they prove that the waters of this well come from Auvergne, about 130 miles distant. If this shall be proved, the considerable rise of artesian water in other places, where no hills occur near, or where they are bored in the most elevated points in the neighbourhood, will lose every thing puzzling.

This rising is sufficiently remarkable to induce us to communicate some examples from Hericart.

Name of the Well.	Depth of the well from the surface of the place.	Height of the rise above the level of the Seine, at the Point de la Tournelle.
	Paris feet.	Paris feet.
St. Owen - -	150.8	6.2
Same - - -	203.2	11.1
Epinay - -	166.2	24.6
Same - - -	207.8	33.8
Maison Blanche near Paris -	121.6	64.6
Mount Rouge at Paris -	315.5	80.0

The two last wells, exactly those which rise highest above the level of the Seine, are bored on heights, and hence their water remains considerably under the surface of the earth; also in both the

deepest of the bore-holes is still above the level of the Seine, in the first seven metres, in the last about one metre.

In the work of Hericart, a fact is mentioned, which confirms the view of artesian wells already given. Gulfs, in which rivers and rivulets lose themselves, are very frequent in the Jura, and other similar limestone mountains, and there, where the uppermost bed consists of a clayey soil, which opposes the sinking down of the rain, sometimes proves very beneficial in agricultural operations, by carrying away the superfluous water. In some places, M. Hericart remarks, man has imitated this example set by nature with great effect. The draining of the plain of Palans, near to Marseilles, is an example of this. This plain, which is at present covered with beautiful vineyards, was formerly a great marshy basin, without outlet. It was drained by means of great sink holes, which were sunk down to the underlaying porous or cavernous stone, and were connected together by means of a number of ditches or drains. The water which was carried away by these shafts, reached, by means of subterranean canals, the harbours of Mion, near to Cassis, where it appeared again as spouting springs. Here, therefore, man, without intending it, made artesian wells, not for the purpose of obtaining water, but in order to get clear of it.

The following report, published by M. Bruckmann Kongl, Wurtemburg Baurath, in the *Ver handlungen zur Beforderung des Gewerbfleisses in Preussen*, 1830, Lieferung, No. 4, affords a striking proof how varied the uses are of artesian wells. M. Bruckmann caused to be bored, under his inspection, from August 1827, to December 1829, at Heilbronn, five bore holes for fresh water, in order to obtain the necessary quantity of pure water for the purposes of two paper mills and a flax spinning mill. Two of the bore holes were sunk to a depth of sixty feet, one to ninety, another to 100 feet, and one to 112 feet under the lowest level of the Neckar. In all of them the water rose eight feet above the level of the Neckar, and on an average each delivered from forty to fifty cubic feet. The purpose of the borings was perfectly accomplished, even to overflow; but the discovery was made that the water of all the bore holes had constantly a temperature of 54.5 Fah. This fact led M. Bruckmann to a very important application of this water, viz. heating the mills with it. The paper mill contained 72,000 cubic feet, a working hall over it 10,800 cubic feet. Both spaces, which contained together 82,800 cubic feet, were the whole winter, 1829–1830, through, warmed by this water alone to a temperature of 45°.5 Fah. and 47°.7 Fah. and when without, the temperature was 24.2 Fah. The thermometer in the mills did not sink lower than 41° Fah. even when the doors were kept open. Every miller knows well how much labour, time and expense it occasions in hard winters to heat daily, and even in a scanty manner, the water wheels, and with what risk of life it is attended. It was reserved for Mr. Bruckmann, by means of artesian water, to free his water mills from this burdensome evil. He conducted the running water from the Hollander, which still possessed a temperature of 52°.2 Fah., through tubes into the Wassergasse, and had thus

the satisfaction to find that his water wheels, the whole winter through, even when the external temperature was as low as 24°.2 Fah. never froze.*—*Poggendorf's Annalen, H. ii.* 1831.

Meteorological Observations for February, 1832.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P. M.	Barometer. Sun rise.	Barometer. 2 P. M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches.	Inches.				Inches.	
⊗	1	25°	33°	30.15	30.25	26	W. SE.	Moderate.		Clear day.
	2	34	44	30.04	30.00	36	SW.	do.		Cloudy day.
	3	40	56	30.00	30.00	47	SW.	do.		Clear—cloudy.
	4	48	44	30.00	30.24	42	NW. NE.	do.		Cloudy day.
	5	32	32	30.10	29.30	25	NE. NW.	do.	.75	Rain—snow.
	6	21	30	29.30	30.50	10	NE. E.	do.		Clear—cloudy.
	7	29	39	29.90	30.00	13	W. NE.	do.		Cloudy day.
	8	26	29	30.30	30.40	26	SE. E.	do.	.90	Sleet and snow.
☽	9	23	32	30.00	29.85	27	SE.	do.	.60	Cloudy—rain.
	10	32	32	29.90	30.10	29	W.	do.		Cloudy—trees loaded with ice.
	11	28	32	30.25	30.20	38	SE.	do.		Clear—cloudy
	12	45	56	29.70	30.09	54	E.	Blustering.	.11	Rain in the night.
	13	34	35	30.00	30.10	19	SE.	do.	.30	Cloudy—rain.
	14	30	36	30.30	30.30	37	W.	Moderate.	.5	Flying clouds—clear.
⊙	15	32	42	30.20	30.30	37	W.	do.		Snow—flying clouds.
	16	29	32	30.40	29.84	24	SW.	do.	.20	Drizzle—flying cl'ds. rain &
	17	16	26	29.90	29.80	11	W.	do.		Cloudy day. [snow at nt.
	18	36	54	29.80	29.70	45	SW. W.	do.		Cloudy day.
	19	49	65	29.60	29.55	54	SW.	do.		Clear—cloudy.
	20	50	40	29.55	29.55	40	N. NW.	do.		Cloudy—flying clouds.
	21	19	22	29.80	29.94	9	W.	Blustering	.56	Cloudy day.
	22	16	34	30.30	30.40	14	SW.	Moderate.	.19	Rain—cloudy—snow in
	23	42	42	30.20	30.10	32	SW.	do.		Clear day [the night.
	24	8	13	30.44	30.50	5	W. N.	do.		Clear day
☾	25	19	30	30.33	30.10	26	E. N.	do.	.13	Cloudy day—snow in the
	26	31	35	30.00	30.10	30	N. W.	do.		Cloudy—clear. [night.
	27	36	45	30.10	30.13	16	NW. SE.	do.	.90	Cloudy—rain—sleet.
	28	32	40	29.90	29.80	35	SE.	do.	.30	Cloudy—rain.
	29	43	43	29.90	30.00	33	W.	do.		Rain—cloudy.
	Mean	30.86	36.55	30.01	30.03	28.62			4.19	Fog—clear

	Thermometer.	Barometer.
Maximum height during the month,	65. on 19th.	30.60 on 12th.
Minimum do.	8. on 24th.	29.30 on 5th and 6th.
Mean do.	33.75	30.02

* The period will come when we shall be forced to look out for a substitute for coal. If when that time arrives, no new means of procuring heat economically shall be discovered, we may be able to draw from the great subterranean depository of caloric, and partly by means of the subterranean waters, heat for our various wants.